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RAPPORT D'ACTIVITES DANS LE CADRE DU RENOUVELLEMENT DU MANDAT
DE PROFESSEUR ASSOCIE DE M. *DIMITRI VAN DE VILLE*

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Dossier de renouvellement du mandat

Décembre 2023

A l'attention de:

- Prof. Antoine Geissbuhler, Doyen de la Faculté de Médecine, UNIGE

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1 Rapport d'activités

1.1 Période du mandat

Du 1/09/2019 au 30/09/2024.

1.2 Activités d'enseignement

Le certificat d'enseignement est fourni séparément.

Liste des cours

Mon activité d'enseignement se concentre sur des aspects méthodologiques de la neuroimagerie, y compris les bases fondamentales telles que le traitement des signaux et des images. Certains cours enseignés à l'EPFL (Neural Signals and Signal Processing, Signal Processing for Functional Brain Imaging) sont également attractifs pour les doctorants de l'UNIGE, en particulier ceux inscrits dans l'École Lémanique en Neurosciences.

- 2020-2022 Guest lecture « Resting-State fMRI », Techniques for Investigating Brain Function (24N05), Master et Post-gradué, UNIGE (organisé par C. Michel)
- 2008, 2010, 2012, 2014, 2018 Advanced Topics in Functional MRI in Cognitive and Clinical Neuroscience, Lemanic Doctoral School in Neuroscience, UNIGE (avec P. Vuilleumier)
- 2011-2021 Signal Processing for Functional Brain Imaging (100%, MICRO-513, 3 ECTS), Master, EPFL
- 2011- Image Processing I (50%, MICRO-511, 3 ECTS), Master, EPFL (avec M. Unser)
- 2011- Image Processing II (66%, MICRO-512, 3 ECTS), Master, EPFL (avec M. Unser)
- 2022- Neural Signals and Signal Processing (66%, NX-421, 6 ECTS), Master, EPFL (avec S. Micera)

Supervision des MD-PhD à l'UNIGE

- 2023 "Artificial Intelligence in Neurovascular Imaging," Jeremy Hofmeister
- 2023 "Prédire la récupération fonctionnelle après un accident vasculaire cérébral ischémique grâce à la connectivité globale," Cyprien Rivier

Supervision des doctorants à l'UNIGE

- 2020-2023 Bianca Borsarini, directeur de thèse avec Nadia Micali
- 2020-2023 Edeny Baaklini, directeur de thèse avec Jocelyne Bloch (CHUV)
- 2020- Farnaz Delavari, co-directeur de thèse avec Stephan Eliez
- 2020- Mi Xue Tan, co-directeur de thèse avec Patrik Vuilleumier
- 2021- Aïda Fall, co-directeur de thèse avec Paul Unschuld
- 2022- Silas Forrer, co-directeur de thèse avec Stephan Eliez
- 2023- Luigi Saccaro (SNSF MD-PhD Fellowship), directeur de thèse avec Camille Piguet

Par ailleurs, j'ai encadré 10 doctorants à l'EPFL, dont 2 avec Petra Hüppi comme co-directrice de l'UNIGE: Serafeim Loukas (2021) et Lorena Freitas (2020).

Liaison avec le Master en Neuro-X à l'EPFL

Depuis 2022, je suis le Directeur de Section à l'EPFL pour la mise en place et la gestion d'un nouveau diplôme d'ingénieur « Master in Neuro-X ». L'attractivité de ce Master pour des étudiants de plusieurs programmes de Bachelor en ingénierie (p.ex. Life Science Engineering, Systems and Communications, Microengineering, Electrical Engineering) semble avérée, avec 47 étudiants qui ont démarré en 2022 et 74 en 2023. Beaucoup de ces étudiants sont intéressés par des projets de semestre et des projets de diplôme avec une pertinence clinique. En tant que directeur de section et étant familier avec les recherches de mes collègues à la Faculté de Médecine de l'UNIGE, je peux renseigner et guider ces étudiants de manière optimale.

1.3 Activités de recherche

Mon thème de recherche interdisciplinaire porte sur la neuroimagerie, le traitement des données générées, et la modélisation en réseaux de l'activité cérébrale humaine. Je favorise une synergie entre les questions neuroscientifiques et le développement de nouvelles méthodes. Cette motivation est issue des interactions fructueuses avec les collègues à l'UNIGE.

Les travaux sur l'analyse des réseaux cérébraux à l'échelle meso- et macroscopique se sont poursuivis [J31], [J50], [R5], [J67], [J70], [J74], [J86], [J94], [J104], [J116] selon plusieurs axes: en examinant la capacité de moments brefs de connectivité fonctionnelle pour l'empreinte digitale cérébrale par IRM fonctionnelle [J64] et MEG [J57], en quantifiant le couplage en activité cérébrale et l'anatomie sous-jacente [J21], [J82], [J109], en élargissant notre champ d'action sur la moelle épinière ce qui a permis de révéler pour la première fois l'organisation fonctionnelle complexe de l'activité chez l'humain en état de repos [J4], [J24], [R3], [J80], [J99].

Ces développements ont trouvé des applications multiples telles que l'AVC [J9], [J29], [J49], [J88], [J89], l'agénésie du corps calleux [J11], [J58]–[J61], l'épilepsie [J78], l'autisme [J68], la schizophrénie et la microdélétion 22q11 [J17], [J42], [J56], [J65], [J69], [J92], [J117], le sommeil [J62], [J63], les troubles de l'humeur et la régulation émotionnelle [J44], [J45], [J48], [J51], [J53], [J54], [J81], [J93], les effets de la naissance prématurée [J11], [J25], [J33], [J36], [J43], [J74], [J83], [J105], [J111], la COVID-19 [J12], [J13], [J34], la démence [J22], [J37], [J39], [J46], [R6], la sclérose en plaques [J38].

Cette recherche a été financée pendant la période du mandat par 11 projets avec un montant total attribué au laboratoire de plus que 2M CHF. Le financement attribué au laboratoire est indiqué entre parenthèses si différent du montant total:

2022-2026	SNSF Research Project, requérant, 668'810 CHF, Imaging and Modeling of Simultaneous Brain and Cervical Spinal Cord
2021-2023	Boninchi Foundation, requérant, 50'000 CHF, BrainCom
2023-2027	SNSF Sinergia, co-requérant avec Patric Hagmann (UNIL, requérant) et Serge Vuilleumoz (HUG, co-requérant), 2'796'351 CHF (615'523 CHF), Precision Mapping of Electrical Brain Network Dynamics with Application to Epilepsy
2022-2027	Horizon Europe Pathfinder Challenges, co-requérant avec Mickael Tanter (EPSCI, Paris, requérant) and consortium, 5'085'411 EUR (608'690 CHF), Remote Whole-Brain Functional Microscopy of the Vascular System: A Paradigm Shift for the Monitoring and Treatment of Small Vessel Diseases
2021-2023	PHRT Pioneer Imaging Project, co-requérant avec Michael Unser (EPFL, requérant), 499'984 CHF (216'992 CHF), Standardized Pipelines for the Accelerated Transfer of Advanced Imaging Software to Clinics
2020-2022	Bertarelli Foundation, co-requérant avec Paul Krack (Inselspital, requérant), Olaf Blanke (EPFL, co-requérant), et Vanessa Fleury (HUG, co-requérant), 297'349 CHF (26'368 CHF), Unraveling the Impact of Levodopa on Dysfunctional Brain Networks in Parkinson's Disease with Neuropsychiatric Fluctuations
2020-2023	SNSF NCCR, chercheur associé sous la direction de Balthasar Bickel (UZH), Anne-Lise Giraud et Daphné Bavelier (UNIGE), Klaus Zuberbühler (UniNE), 16'993'200 CHF (400'000 CHF), The Origins and Future of Language
2018-2021	SNSF Sinergia Grant, co-requérant avec Patrik Vuilleumier (UNIGE, requérant) et Ronan Boulic (EPFL, co-requérant), 2'150'667 CHF (619'275 CHF), Charting Emotion Components and Dynamics in the Human Brain using Virtual Reality and Cinema
2018-2021	Bertarelli Foundation, requérant avec Olaf Blanke (EPFL, co-requérant) et Paul Krack (HUG, co-requérant), 295'200 CHF (196'600 CHF), Novel biomarkers and therapeutics for hallucinations in Parkinson's disease using robotically-driven neurofeedback
2016-2020	SNSF Research Project, requérant, 327'825 CHF, Advanced Network Analysis to Study Brain Dynamics in Health and Disorder
2018-2019	Boninchi Foundation, requérant, 75'000 CHF, Understanding Neurodevelopmental Outcomes in Children and Adolescents with Agenesis of the Corpus Callosum using Structural and Functional Imaging

2018-2019	Zeiss Research IDEAS, requérant, 100'000 CHF, WormNets: Exploring C. Elegans Large-Scale Functional Networks Using Whole Animal 3D Light Microscopy
2017-2022	SNSF Research Project, requérant, 226'964 CHF, Graph Slepian Designs for Directed and Tunable Network Analysis
2017-2023	Wyss Center for Bio- and Neuro-Engineering, requérant avec Pascal Senn (HUG, co-requérant) and Sven Haller, 624'990 CHF, NeuroTin: Physiological Regulation of Chronic Tinnitus

Mon laboratoire se trouve au Campus Biotech ce qui m'a permis d'établir des collaborations avec les groupes de recherche de l'UNIGE. Quelques exemples notables:

- Wyss Center Project avec Pascal Senn (HUG)
- SNSF Sinergia Project avec Patrik Vuilleumier (UNIGE) [J3], [J6], [J44]
- SNSF Sinergia Project avec Serge Vulliemoz (HUG) [J78]
- Bertarelli Foundation Project avec Olaf Blanke (EPFL/HUG) et Paul Krack (HUG, maintenant UNIBE) [J37]
- Partenaire dans plusieurs projets SNSF de Petra Hüppi avec de multiples publications en commun [J11], [J25], [J33], [J36], [J43], [J74], [J83], [J105], [J111]
- Partenaire SNSF COVID-COG Project de Julie Péron (HUG). Ce projet a été reconnu comme "excellent" et "un des meilleurs résultats du NRP-78" [J12], [J13], [J34]
- Partenaire SNSF Regular Project de Patrik Vuilleumier (UNIGE)
- Partenaire SNSF Regular Project de Virginie Sterpenich (UNIGE)
- Partenaire SNSF Regular Project de Fabienne Picard (HUG), soumis
- Partenaire SNSF Regular Project de Sophie Schwartz (UNIGE), soumis

Récompenses et prix

En 2020, j'ai été élevé au rang de Fellow de l'IEEE Signal Processing Society (SPS) "*for contribution to image processing for computational brain imaging*". Aussi, j'étais IEEE Distinguished Lecturer de l'IEEE SPS pour la Class 2021-2022.

En 2023, j'ai été élevé au rang de Fellow de l'European Association for Signal Processing (EURASIP) "*for contributions to biomedical image and signal processing and application to functional brain imaging*". J'étais le Fellow choisi pour la séance plénière inaugurale intitulée "Signals, graphs, and brains: an interdisciplinary tale" lors de la conférence EUSIPCO (Helsinki, Finlande, 4-8 septembre).

Membres de mon groupe, étudiants et collaborateurs proches qui ont reçu des récompenses pendant le mandat:

2023	Vasco Sanz Award, Luigi Saccaro, pour son travail prédoctoral [J10]
2021	Prix Jean-Falk-Vairant, Karin Bortolin, Best Presentation at the NeuroLeman Meeting [J17]
2020	PhD Thesis Distinction in Electrical Engineering, Thomas Bolton
2020	Swiss Society for Biomedical Engineering Research Award for PhD Dissertation, Thomas Bolton
2019	Best PhD Thesis Award in Electrical Engineering, Daniela Zöllner
2019	Best Master's Thesis in Bioengineering, IBM Research in Computational Science, Anaheim-Mattile Award of the Foundation Marguerite, Veronica Ravano
2019	Best Poster Award for Master in Computational Science Engineering, Cécile Le Sueur
2019	Prix d'excellence du jeune chercheur de la Faculté de Biologie et de Médecine, UNIL, Constantin Tuleasca
2019	Swiss Society for Neuroscience (SSN) Best Paper Award in Human and Clinical Neuroscience, Daniela Zöllner

1.4 Publications pendant la période du mandat

Au total 117 articles et 10 articles de revue ou éditoriaux ont été publiés.

En cours d'impression

- [I1] H. Behjat, A. Tarun, D. Abramian, M. Larsson, and **D. Van De Ville**, “Voxel-wise brain graphs from diffusion MRI: Intrinsic eigenspace dimensionality and application to functional MRI”, *IEEE Open Journal of Engineering in Medicine and Biology*, in press. DOI.
- [I2] S. Leserri, A. Segura-Amil, A. Nowacki, I. Debove, K. Petermann, L. Schäppi, M. G. Preti, **D. Van De Ville**, C. Pollo, S. Walther, and T. A. K. Nguyen, “Linking connectivity of deep brain stimulation of nucleus accumbens area with clinical depression improvements – a retrospective longitudinal case series”, *European Archives of Psychiatry and Clinical Neuroscience*, in press.
- [I3] E. Morgenroth, L. Vilaclara, M. Muszynski, J. Gaviria, P. Vuilleumier, and **D. Van De Ville**, “Probing neurodynamics of experienced emotions: A hitchhiker’s guide to film fMRI”, *Social Cognitive and Affective Neuroscience*, in press.
- [I4] **D. Van De Ville** and R. Liégeois, “Dynamic functional connectivity to tile the spatiotemporal mosaic of brain states”, *Imaging Neuroscience*, in press.

Articles dans des journaux scientifiques avec politique éditoriale (2019-2023)

- [J1] M. Miri, V. Abootalebi, H. Saeedi-Sourck, **D. Van De Ville**, and H. Behjat, “Spectral representation of EEG data using learned graphs with application to motor imagery decoding”, *Biomedical Signal Processing and Control*, vol. 87, p. 105 537, 2024. DOI.
- [J2] T. B. Bolton, **D. Van De Ville**, E. Amico, and R. Liégeois, “The arrow-of-time in neuroimaging time series identifies causal triggers of brain function”, *Human Brain Mapping*, vol. 44, pp. 4077–4087, 10 2023. DOI.
- [J3] F. Delavari, H. Rafi, C. Sandini, R. J. Murray, C. Latrèche, **D. Van De Ville**, and S. Eliez, “Amygdala subdivisions exhibit aberrant whole-brain functional connectivity in relation to stress intolerance and psychotic symptoms in 22q11.2DS”, *Translational Psychiatry*, vol. 13, 145 2023. DOI.
- [J4] N. Kinany, A. Khatibi, O. Lungu, J. Finsterbusch, C. Büchel, V. Marchand-Pauvert, **D. Van De Ville**, S. Vahdat, and J. Doyon, “Decoding cerebro-spinal signatures of human behavior: Application to motor sequence learning”, *NeuroImage*, vol. 275, p. 120 174, 2023. DOI.
- [J5] D. Marie, C. A. Müller, E. Altenmüller, **D. Van De Ville**, K. Jünemann, D. S. Scholz, T. H. Krüger, F. Worschech, M. Kliegel, C. Sinke, and C. E. James, “Music interventions in 132 healthy older adults enhance cerebellar grey matter and auditory working memory, despite general brain atrophy”, *Neuroimage: Reports*, vol. 3, no. 2, p. 100 166, 2023, issn: 2666-9560. DOI.
- [J6] G. Mohammadi, **D. Van De Ville**, and P. Vuilleumier, “Brain networks subserving functional core processes of emotions are identified with componential modeling”, *Cerebral Cortex*, vol. 33, pp. 7993–8010, 12 2023. DOI.
- [J7] A. Nuber-Champier, A. Cionca, G. Breville, P. Voruz, I. Jacot de Alcântara, G. Allali, P. Lalive, L. Benzakour, K.-O. Lövblad, O. Braillard, M. Nehme, M. Coen, J. Serratrice, J.-L. Reny, J. Pugin, I. Guessous, B. N. Landis, A. Griffa, **D. Van De Ville**, F. Assal, and J. Péron, “Acute TNF α levels predict cognitive impairment 6–9 months after COVID-19 infection”, *Psychoneuroendocrinology*, vol. 153, p. 106 104, 2023. DOI.
- [J8] I. Rigoni, J. Rué Queralt, K. Glomb, M. Preti, N. Roehri, S. Tourbier, L. Spinelli, M. Seeck, **D. Van De Ville**, P. Hagmann, and S. Vulliémoz, “Structure-function coupling increases during interictal spikes in temporal lobe epilepsy: A graph signal processing study”, *Clinical Neurophysiology*, vol. 153, pp. 1–10, 2023. DOI.
- [J9] C. Rivier, M. G. Preti, **D. Van De Ville**, A. G. Guggisberg, and E. Pirondini, “Prediction of post-stroke motor recovery benefits from measures of sub-acute widespread network damages”, *Brain Communications*, vol. 5, fcd055, 2 2023. DOI.
- [J10] L. F. Saccaro, J. G. Lopez, **D. Van De Ville**, and C. Piguet, “Dynamic functional hippocampal markers of residual depressive symptoms in euthymic bipolar disorder”, *Brain and Behavior*, vol. 13, e3010, 6 2023. DOI.
- [J11] V. Siffredi, M. C. Liverani, **D. Van De Ville**, L. G. Freitas, C. Borradori Tolsa, P. S. Hüppi, and R. Ha-Vinh Leuchter, “Corpus callosum structural characteristics in very preterm children and adolescents: Developmental trajectory and relationship to cognitive functioning”, *Developmental Cognitive Neuroscience*, vol. 60, p. 101 211, 2023. DOI.
- [J12] M. Thomasson, P. Voruz, A. Cionca, I. Jacot de Alcântara, A. Nuber-Champier, G. Allali, L. Benzakour, P. H. Lalive, K.-O. Lövblad, O. Braillard, M. Nehme, M. Coen, J. Serratrice, J.-L. Reny, J. Pugin, I. Guessous, B. N. Landis, A. Griffa, **D. Van De Ville**, F. Assal, and J. A. Péron, “Markers of limbic system damage following SARS-CoV-2 infection”, *Brain Communications*, vol. 5, no. 4, fcd177, Jun. 2023. DOI.
- [J13] P. Voruz, A. Cionca, I. Jacot de Alcântara, A. Nuber-Champier, G. Allali, L. Benzakour, P. H. Lalive, K. O. Lövblad, O. Braillard, M. Nehme, M. Coen, J. Serratrice, J.-L. Reny, J. Pugin, I. Guessous, R. Ptak, B. N. Landis, D. Adler, A. Griffa, **D. Van De Ville**, F. Assal, and J. A. Péron, “Brain functional connectivity alterations associated with neuropsychological performance 6–9 months following SARS-CoV-2 infection”, *Human Brain Mapping*, vol. 44, pp. 1629–1646, 2023. DOI.

- [J14] T. A. W. Bolton, **D. Van De Ville**, J. Régis, T. Witjas, N. Girard, M. Levivier, and C. Tuleasca, “Morphometric features of drug-resistant essential tremor and recovery after stereotactic radiosurgical thalamotomy”, *Network Neuroscience*, vol. 6, pp. 850–869, 3 2022. [DOI](#).
- [J15] T. A. W. Bolton, **D. Van De Ville**, J. Régis, T. Witjas, N. Girard, M. Levivier, and C. Tuleasca, “Graph theoretical analysis of structural covariance reveals the relevance of visuospatial and attentional areas in essential tremor recovery after stereotactic radiosurgical thalamotomy”, *Frontiers in Aging Neuroscience*, vol. 14, p. 873 605, 2022. [DOI](#).
- [J16] — —, “Exploring the heterogeneous morphometric data in essential tremor with probabilistic modelling”, *NeuroImage: Clinical*, p. 103 283, 2022, issn: 2213-1582. [DOI](#).
- [J17] K. Bortolin, F. Delavari, M. G. Preti, C. Sandini, V. Mancini, E. Mullier, **D. Van De Ville**, and S. Eliez, “Neural substrates of psychosis revealed by altered dependencies between brain activity and white-matter architecture in individuals with 22q11 deletion syndrome”, *NeuroImage: Clinical*, vol. 35, p. 103 075, 2022. [DOI](#).
- [J18] N. Davydov, L. Peek, T. Auer, E. Prilepin, N. Gninenko, **D. Van De Ville**, A. Nikonorov, and Y. Koush, “Real-time and recursive estimators for functional MRI quality assessment”, *Neuroinformatics*, 2022. [DOI](#).
- [J19] H. Dhanis, E. Blondiaux, T. Bolton, N. Faivre, G. Rognini, **D. Van De Ville**, and O. Blanke, “Robotically-induced hallucination triggers subtle changes in brain network transitions”, *NeuroImage*, vol. 248, p. 118 862, 2022. [DOI](#).
- [J20] L. Fleury, P. J. Koch, M. J. Wessel, C. Bonvin, D. San Millan, C. Constantin, P. Vuadens, J. Adolphsen, A. Cadic Melchior, J. Brügger, E. Beanato, M. Ceroni, P. Menoud, D. De Leon Rodriguez, V. Zufferey, N. H. Meyer, P. Egger, S. Harquel, T. Popa, E. Raffin, G. Girard, J.-P. Thiran, C. Vaney, V. Alvarez, J.-L. Turlan, A. Mühl, B. Léger, T. Morishita, S. Micera, O. Blanke, **D. Van De Ville**, and F. C. Hummel, “Toward individualized medicine in stroke—the TiMeS project: Protocol of longitudinal, multi-modal, multi-domain study in stroke”, *Frontiers in Neurology*, vol. 13, 2022. [DOI](#).
- [J21] A. Griffa, E. Amico, R. Liégeois, **D. Van De Ville**, and M. G. Preti, “Brain structure-function coupling provides signatures for task decoding and individual fingerprinting”, *NeuroImage*, vol. 250, p. 118 970, 2022. [DOI](#).
- [J22] A. Griffa, G. Bommarito, F. Assal, M. G. Preti, R. Goldstein, S. Armand, F. R. Herrmann, **D. Van De Ville**, and G. Allali, “CSF tap test in idiopathic normal pressure hydrocephalus: Still a necessary prognostic test?”, *Journal of Neurology*, vol. 269, pp. 5114–5126, 2022. [DOI](#).
- [J23] K. Jünemann, D. Marie, F. Worschech, D. S. Scholz, F. Grouiller, M. Kliegel, **D. Van De Ville**, C. E. James, T. H. C. Krüger, E. Altenmüller, and C. Sinke, “Six months of piano training in healthy elderly stabilizes white matter microstructure in the fornix, compared to an active control group”, *Frontiers in Aging Neuroscience*, vol. 14, 2022. [DOI](#).
- [J24] N. Kinany, E. Pirondini, L. Mattera, R. Martuzzi, S. Micera, and **D. Van De Ville**, “Towards reliable spinal cord fMRI: Assessment of common imaging protocols”, *NeuroImage*, vol. 250, p. 118 964, 2022, issn: 1053-8119. [DOI](#), (on cover page).
- [J25] S. Loukas, L. Lordier, D.-E. Meskaldji, M. Filippa, J. Sa de Almeida, **D. Van De Ville**, and P. S. Hüppi, “Musical memories in newborns: A resting-state functional connectivity study”, *Human Brain Mapping*, vol. 43, pp. 647–664, 2 2022. [DOI](#).
- [J26] S. Mortaheb, L. Van Calster, F. Raimondo, M. A. Klados, P. A. Boulakis, K. Georgoula, S. Majerus, **D. Van De Ville**, and A. Demertzi, “Mind blanking is a distinct mental state linked to a recurrent brain profile of globally positive connectivity during ongoing mentation”, *Proceedings of the National Academy of Sciences of the USA*, vol. 119, no. 41, e2200511119, 2022. [DOI](#).
- [J27] R. J. Murray, K. Gentsch, E. Pham, Z. Celen, J. Castro, N. Perroud, **D. Van De Ville**, P. Vuilleumier, and C. Piguët, “Identifying disease-specific neural reactivity to psychosocial stress in borderline personality disorder”, *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, vol. 7, pp. 1137–1148, 11 2022. [DOI](#).
- [J28] A. Omidvarnia, R. Liégeois, E. Amico, M. G. Preti, A. Zalesky, and **D. Van De Ville**, “On the spatial distribution of temporal complexity in resting state and task functional MRI”, *Entropy*, vol. 24, no. 8, p. 1148, 2022. [DOI](#).
- [J29] E. Pirondini, N. Kinany, C. Le Sueur, J. C. Griffis, G. L. Shulman, M. Corbetta, and **D. Van De Ville**, “Post-stroke reorganization of transient brain activity characterizes deficits and recovery of cognitive functions”, *NeuroImage*, vol. 255, p. 119 201, 2022. [DOI](#).
- [J30] D. R. Pur, M. G. Preti, A. de Ribaupierre, **D. Van De Ville**, R. Eagleson, N. Mella, and S. de Ribaupierre, “Mapping of structure-function age-related connectivity changes on cognition using multimodal MRI”, *Frontiers in Aging Neuroscience*, vol. 14, p. 757 861, 2022. [DOI](#).
- [J31] I. Ricchi, A. Tarun, H. Petric Maretic, P. Frossard, and **D. Van De Ville**, “Dynamics of functional network organization through graph mixture learning”, *NeuroImage*, vol. 252, p. 119 037, 2022. [DOI](#).
- [J32] A. Rowald, S. Komi, R. Demesmaeker, E. Baaklini, S. D. Hernandez-Charpak, E. Paoles, H. Montanaro, A. Cassara, F. Becce, B. Lloyd, T. Newton, J. Ravier, N. Kinany, M. D’Ercole, A. Paley, N. Hankov, C. Varescon, L. McCracken, M. Vat, M. Caban, A. Watrin, C. Jacquet, L. Bole-Feysot, C. Harte, H. Lorach, A. Galvez,

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- [R3] N. Kinany, E. Pirondini, S. Micera, and **D. Van De Ville**, “Spinal cord fMRI: A new window into the central nervous system”, *The Neuroscientist*, 2022. [DOI](#).
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- [R8] C. Michel, P. Vuilleumier, and **D. Van De Ville**, “Current opinions in brain imaging methods and applications”, *Brain Topography*, vol. 32, no. 6, pp. 923–925, 2019. [DOI](#).
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1.5 Activités diverses

Activités éditoriales

Je suis membre actif dans la communauté internationale en neuroimagerie et traitement des signaux biomédicaux. Pendant ce mandat, j’ai été éditeur pour plusieurs journaux scientifiques réputés:

2023-	Handling Editor, Imaging Neuroscience
2021-	Senior Board Member, IEEE Signal Processing Magazine
2018-	Editor, SIAM Journal on Imaging Sciences
2020-2023	Handling Editor, NeuroImage:Reports
2019-2022	Senior Editor, IEEE Transactions on Signal Processing

Engagement au service de la communauté

Depuis 2017, je suis membre de la commission d’évaluation Ambizione au SNSF, Division II (MNIST).

Entre 2017-2022, j’ai été membre du Board de la Swiss Society for Bioengineering (SSBE), et président pour la période 2020-2022. J’ai organisé la réunion annuelle de la SSBE au Campus Biotech en août 2019, et j’ai représenté la société suisse à la Joint Conference of the Austrian, German, and Swiss

Societies for Biomedical Engineering (Innsbruck, 28-30 septembre, 2022) avec plus de 800 participants.

Je suis également membre de la Swiss Society for Neuroscience (SSN), de l'Organization for Human Brain Mapping (OHBM), et de l'International Society for Magnetic Resonance in Medicine (ISMRM).

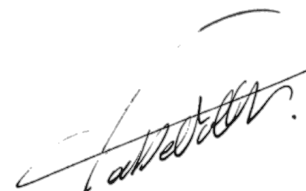
Engagement au service de l'institution

J'ai toujours été très engagé dans la gestion et les activités du CIBM Centre d'Imagerie Biomédicale. Depuis 2015, je suis le responsable de la section « Signal Processing UNIGE-EPFL » qui œuvre pour le développement et la diffusion des techniques d'analyse de données selon les besoins des chercheurs et utilisateurs du CIBM. Depuis 2020, je suis également responsable ad-interim de la section « Animal & Imaging Technology EPFL » qui gère les IRMs 9.4T et 14T précliniques, et 7T humain, sur le site de l'EPFL.

Depuis 2015 mon laboratoire se trouve au Campus Biotech à Genève qui réunit des chercheurs en neuroscience de l'UNIGE et de l'EPFL. Je suis impliqué dans la gestion des plateformes, en particulier comme faculty advisor de la M/EEG facility et depuis mi-2023, comme président du Steering Committee pour l'IRM 7T. Je coordonne également l'équipe Siemens-CIBM qui appuie les utilisateurs de la 7T en termes d'optimisation et développement des protocoles d'acquisition.

Depuis 2018, je suis membre du bureau de la commission informatique (BuCIF) de la faculté de médecine, notamment pour la liaison avec le Campus Biotech.

Prof. Dimitri Van De Ville



Genève, 5/12/2023



**UNIVERSITÉ
DE GENÈVE**

DIVISION DES
RESSOURCES HUMAINES

CAHIER DES CHARGES (corps enseignant)

FONCTION Professeur associé

Nom et prénom du/de la titulaire	VAN DE VILLE Dimitri
Taux d'activité	50%
Faculté, école, institut	Faculté de médecine
Section ou département	Département de radiologie et informatique médicale
Nom et prénom du responsable hiérarchique	GARIBOTTO Valentina

Taux : le total des points 1, 2 et 3 doit atteindre 100%

1. ENSEIGNEMENT ET ENCADREMENT DES ETUDIANTS

Taux consacré 20%

Enseignement prégradué:

- Master en neurosciences.
- Supervision de travaux de master.

Enseignement postgradué:

- Ecole doctorale lémanique en neurosciences: co-organisation et enseignement du cours "Advanced topics in functional MRI in cognitive and clinical neurosciences".
- Autres cours postgradués (p.e. cours "Neural Signals and Signal Processing" (Master Neuro-X EPFL) pour doctorants en neurosciences de l'UNIGE.
- Supervision de MD-PhD et thèses de doctorats.

2. RECHERCHE

Taux consacré 60%

- Recherche dans le développement de nouvelles théories et d'outils pour le traitement des données de neuroimagerie et imagerie médicale (p.e. computational brain function, network modeling, imaging-based biomarkers, compréhension de fonction cérébrale).
- Une synergie avec les projets qui ont l'EPFL comme leading house est établie.
- Développement des activités et collaborations autour de l'IRM 7T au Campus Biotech/CIBM.
- Collaboration avec des équipes locales, nationales et internationales. En particulier, consultant sur les dernières methodologies dans le domaine de la neuroimagerie pour les équipes locales avec le but d'obtenir des financements compétitifs.
- Publications des résultats de la recherche sous forme d'articles originaux et de revues dans des journaux internationaux à politique éditoriale.

3. AUTRES TACHES

3.1. GESTION, ORGANISATION, ADMINISTRATION, DIRECTION

Taux consacré 20%

- Responsabilité de gestion des fonds de recherche.
- Gestion des ressources humaines des collaborateurs scientifiques et techniques du groupe de recherche.
- Membres des commissions pertinentes au Campus Biotech et CIBM Centre d'imagerie biomédicale.
- Membre du Bureau de la Commission d'Informatique de la Faculté de médecine.
- Participation aux séances du Collège des professeurs de la Faculté de médecine et à des commissions facultaires.

Le/la titulaire participera aux tâches de gestion et d'organisation qui sont liées au domaine spécifique qui lui est confié.

3.2. SERVICES A LA CITE

Dans le cadre de son activité, le/la titulaire doit être prêt-e, le cas échéant, à exercer vis-à-vis de la collectivité, une fonction de service rentrant dans la mission de l'Université, ce type d'activité faisant *ipso facto* partie du cahier des charges.

4. AUTRES DISPOSITIONS

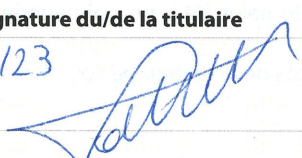
Professeur associé à l'EPFL (Institut Neuro-X, STI).

Par sa signature, le/la candidat/e atteste qu'il/elle a pris connaissance de la proposition de cahier des charges afférent au poste mis au concours qui sera soumise à l'autorité de nomination/d'engagement. La proposition de cahier des charges signée ne saurait en aucun cas être considérée comme un acte d'engagement. Seule la décision de nomination et/ou la signature d'un contrat de travail par l'autorité compétente selon le règlement sur le personnel de l'Université valent acte d'engagement.

Date et signature du responsable hiérarchique

5/12/23 

Date et signature du/de la titulaire

5/12/23 



A QUI DE DROIT

CERTIFICAT

Le soussigné atteste que le Professeur Dimitri VAN DE VILLE contribue à la formation pré-graduée des étudiant-es de la Faculté de médecine dans le cadre des cours du Master en neurosciences ainsi que pour la supervision des mémoires de Master en médecine humaine.

Il remplit ainsi ses obligations.

Genève, octobre 2023

Pr Mathieu Nendaz
Vice-doyen

■ Informations personnelles

- Van De Ville, Dimitri
- 24 mai 1975
- belge, suisse
- La Couronnette 1, 1166 Perroy
- ORCID: 0000-0002-2879-3861
- Dimitri.VanDeVille@unige.ch
- Campus Biotech, Chemin des Mines 9, 1202 Genève

■ Formation

PhD

- **01/2002**
- **PhD in Computer Science Engineering**
- Université de Gand
- Gand, Belgique

M.Sc.

- **07/1998**
- **M.Sc. in Computer Science Engineering** (Summa cum laude)
- Université de Gand
- Gand, Belgique

■ Emplois

- **09/2015-**
- **Professeur associé en bio-ingénierie (100%)**
- École polytechnique fédérale de Lausanne
- Lausanne/Genève, Suisse
- **09/2009-08/2015**
- **Professeur assistant avec prët titularisation conditionnelle (100%)**
- Université de Genève et École polytechnique fédérale de Lausanne
- Lausanne/Genève, Suisse
- **12/2005-08/2009**
- **Maître Assistant (100%) au Département de radiologie et informatique médicale**
- Université de Genève
- Genève, Suisse
- **04/2002-11/2005**
- **Post-doc (100%) au Laboratoire d'imagerie biomédicale**

- École polytechnique fédérale de Lausanne
- Lausanne, Suisse
- **09/1998-01/2002**
- **Doctorant (100%) au Department of Electronics and Information Systems**
- Université de Gand
- Gand, Belgique

■ Age académique

Années depuis la première publication : 23

■ Récompenses et prix

- 2023 : Fellow of the European Association for Signal Processing (EURASIP) *for contributions to biomedical image and signal processing and application to functional brain imaging*
- 2021-2022 : IEEE Distinguished Lecturer of the Signal Processing Society
- 2020 : Fellow of the IEEE Signal Processing Society *for contribution to image processing for computational brain imaging*
- 2016 : Leenaards Award, avec Dr. Arnaud Saj et Dr. Andrea Serino
- 2014 : NARSAD Independent Investigator Award
- 2013 : NeuroImage Editors' Choice Award
- 2012 : Pfizer Research Award, categorie *Neurosciences and nervous system diseases*

■ Compétences linguistiques

Français : très bon / Néerlandais : langue maternelle / Anglais : très bon / Allemand : bases

■ Auto-évaluation

Mon thème de recherche principal porte sur la neuroimagerie, le traitement des données générées et la modélisation en réseaux de l'activité cérébrale humaine. Cette recherche interdisciplinaire a progressé selon deux axes majeurs :

La dynamique temporelle de l'activité cérébrale

L'IRM fonctionnelle mesure l'activité cérébrale à travers le couplage neurovasculaire et les variations de flux sanguin et d'oxygénation. Nous avons été les premiers à développer des méthodes de déconvolution régularisée en s'appuyant sur la parcimonie des transitions entre différents états. Cette approche permet d'identifier un répertoire riche de réseaux cérébraux liés aux processus sensoriels et associatifs. Cette nouvelle méthodologie a suscité un vif intérêt et contribué au concept du « connectome fonctionnel dynamique ». Parmi ses nombreuses applications, elle a été utilisée pour analyser la dynamique cérébrale pendant la rumination des patients dépressifs ou la régulation émotionnelle pendant le visionnage de films. En combinaison avec l'apprentissage automatique, elle permet d'exploiter la nature multivariée des mesures de connectivité fonctionnelle (FC) pour des applications cliniques, l'identification d'individus ou la détection de dysfonctionnements cérébraux.

Nous avons étendu cette approche pour l'IRMf de la moelle épinière. Étonnamment, la moelle en état de repos montre une activité riche et structurée. Notre analyse a démontré pour la première fois des principes d'organisation in-vivo chez l'humain tels que l'inhibition inter-segmentale.

Avancer le traitement des signaux cérébraux sur des graphes

Nous avons également proposé une nouvelle méthode de traitement du signal sur graphe (« graph signal processing », GSP). Dans ce cas, le graphe est construit sur la base de mesures de connectivité structurelle établie par la tractographie à partir de données de diffusion obtenues par l'IRM. Les signaux sur le graphe sont extraits des données fonctionnelles. Cette méthode permet de redéfinir des concepts fondamentaux d'analyse harmonique pour un graphe cérébral et d'appliquer de nouvelles opérations aux données fonctionnelles. Nous avons démontré l'utilité de cette méthode pour quantifier le couplage entre la fonction et la structure cérébrale. Cela nous a permis de révéler un gradient spatial de couplage-à-découplage qui corrobore l'axe sensorimoteur-association en organisation cérébrale.

■ Résultats de recherche

Publications (5)

[1] M. G. Preti, T. Bolton & D. Van De Ville. The Dynamic Functional Connectome: State-of-the-Art and Perspectives. *NeuroImage*, **2017**, 160, 41-54
<https://archive-ouverte.unige.ch/unige:104893>

Article de revue qui est devenu une référence dans le domaine (>1'000 citations) en structurant l'état de l'art sur le connectome fonctionnel dynamique. Nous y mettons aussi en avant nos contributions et le potentiel de ces approches pour des applications en neuroscience cognitive et clinique.

[2] M. G. Preti & D. Van De Ville. Decoupling of Brain Function from Structure Reveals Regional Behavioral Specialization in Humans. *Nature Communications*, **2019**, 10, 4747
<https://archive-ouverte.unige.ch/unige:139850>

Une nouvelle approche pour quantifier la relation entre la connectivité structurelle des fibres axonales et l'activité cérébrale. Le rapport entre alignement et liberté de cette activité en lien avec l'anatomie révèle un gradient spatial qui reflète la complexité des processus mentaux.

[3] N. Kinany, E. Pirondini, S. Micera & D. Van De Ville. Dynamic Functional Connectivity of Resting-State Spinal Cord fMRI Reveals Fine-Grained Intrinsic Architecture. *Neuron*, **2020**, 108, 424-435

<https://archive-ouverte.unige.ch/unige:156905>

Une adaptation de notre approche pour caractériser la dynamique des signaux cérébraux à la moelle épinière, ce qui a permis de révéler pour la première fois l'organisation fonctionnelle complexe de l'activité de la moelle épinière humaine au repos.

[4] E. Pirondini, N. Kinany, C. Le Sueur, J. C. Griffis, G. L. Shulman, M. Corbetta & D. Van De Ville. Post-Stroke Reorganization of Transient Brain Activity Characterizes Deficits and Recovery of Cognitive Functions. *NeuroImage*, **2022**, 255, 119201

En utilisant nos avancées pour caractériser la dynamique des signaux cérébraux, nous explorons le potentiel d'un biomarqueur, basé sur l'imagerie, pour le pronostic chez les patients victimes d'un AVC, sur la base d'un jeu de données longitudinal de référence.

[5] W. Huang, T. A. W. Bolton, J. D. Medaglia, D. S. Bassett, A. Ribeiro & D. Van De Ville. A Graph Signal Processing Perspective on Functional Brain Imaging. *Proceedings of the IEEE*, **2018**, 106, 868-885

<https://archive-ouverte.unige.ch/unige:126139>

Cette nouvelle méthodologie permet à des données en neuroimagerie d'adapter le traitement des signaux sur des graphes, en combinant le connectome structurel (graphe) avec l'IRM fonctionnelle (signaux sur des graphes).

Méthodes et données

Nous avons également contribué à des consortiums internationaux, entre autres pour le développement d'un standard en acquisition d'IRM de la moelle épinière [1], avec un jeu de données de référence [2], ainsi qu'un consensus pour la conception des expériences en rétroaction biologique (neurofeedback) [3].

[1] J. Cohen-Adad, E. Alonso-Ortiz, M. Abramovic, C. Arneitz, N. Atcheson, L. Barlow, R. L. Barry, M. Barth, M. Battiston, C. Büchel, M. Budde, V. Callot, A. J. E. Combes, B. De Leener, M. Descoteaux, P. L. de Sousa, M. Dostál, J. Doyon, A. Dvorak, F. Eippert, K. R. Epperson, K. S. Epperson, P. Freund, J. Finsterbusch, A. Foias, M. Fratini, I. Fukunaga, C. A. M. G. Wheeler-Kingshott, G. Germani, G. Gilbert, F. Giove, C. Gros, F. Grussu, A. Hagiwara, P.-G. Henry, T. Horák, M. Hori, J. Joers, K. Kamiya, H. Karbasforoushan, M. Kev rkovský, A. Khatibi, J.-W. Kim, N. Kinany, H. Kitzler, S. Kolind, Y. Kong, P. Kudliv cka, P. Kuntke, N. D. Kurniawan, S. Kusmia, R. Labounek, M. M. Laganà, C. Laule, C. S. Law, C. Lenglet, T. Leutritz, Y. Liu, S. Llufriu, S. Mackey, E. Martinez-Heras, L. Mattera, I. Nestrail, K. P. O'Grady, N. Papinutto, D. Papp, D. Pareto, T. B. Parrish, A. Pichiechio, F. Prados, À. Rovira, M. J. Ruitenber, R. S. Samson, G. Savini, M. Seif, A. C. Seifert, A. K. Smith, S. A. Smith, Z. A. Smith, E. Solana, Y. Suzuki, G. Tackley, A. Tinnermann, J. Valov sek, D. Van De Ville, M. C. Yiannakas, K. A. Weber, N. Weiskopf, R. G. Wise, P. O. Wyss & J. Xu. Generic Acquisition Protocol and Open-Access Data for Quantitative MRI of the Spinal Cord *Nature Protocols*, **2021**, 16, 4611–4632

[2] J. Cohen-Adad, E. Alonso-Ortiz, M. Abramovic, C. Arneitz, N. Atcheson, L. Barlow, R. L. Barry, M. Barth, M. Battiston, C. Büchel, M. Budde, V. Callot, A. J. E. Combes, B. De Leener, M. Descoteaux, P. L. de Sousa, M. Dostál, J. Doyon, A. Dvorak, F. Eippert, K. R. Epperson, K. S. Epperson, P. Freund, J. Finsterbusch, A. Foias, M. Fratini, I. Fukunaga, C. A. M. Gandini Wheeler-Kingshott, G. Germani, G. Gilbert, F. Giove, C. Gros, F. Grussu, A. Hagiwara, P.-G. Henry, T. Horák, M. Hori, J. Joers, K. Kamiya, H. Karbasforoushan, M. Kev rkovský, A. Khatibi, J.-W. Kim, N. Kinany, H. H. Kitzler, S. Kolind, Y. Kong, P. Kudliv cka, P. Kuntke, N. D. Kurniawan, S. Kusmia, R. Labounek, M. M. Laganà, C. Laule, C. S. Law, C. Lenglet, T. Leutritz, Y. Liu, S. Llufriu, S. Mackey, E. Martinez-Heras, L. Mattera, I. Nestrail, K. P. O'Grady, N. Papinutto, D. Papp, D. Pareto, T. B. Parrish, A. Pichiechio, F. Prados, À. Rovira, M. J. Ruitenber, R. S. Samson, G. Savini, M. Seif, A. C. Seifert, A. K. Smith, S. A. Smith, Z. A. Smith, E. Solana, Y. Suzuki, G. Tackley, A. Tinnermann, J. Valov sek, D. Van De Ville, M. C. Yiannakas, K. A. Weber II, N. Weiskopf, R. G. Wise, P. O. Wyss & J. Xu. Open-Access Quantitative MRI Data of the Spinal Cord and Reproducibility Across

[3] T. Ros, S. Enriquez-Geppert, V. Zotev, K. D. Young, G. Wood, S. Whitfield-Gabrieli, F. Wan, P. Vuilleumier, F. Vialatte, D. Van De Ville, D. Todder, T. Surmeli, J. S. Sulzer, U. Strehl, M. B. Serman, N. J. Steiner, B. Sorger, S. R. Soekadar, R. Sitaram, L. H. Sherlin, M. Schöenberg, F. Scharnowski, M. Schabus, K. Rubia, A. Rosa, M. Reiner, J. A. Pineda, C. Paret, A. Ossadtchi, A. A. Nicholson, W. Nan, J. Minguez, J.-A. Micoulaud-Franchi, D. M. A. Mehler, M. Lührs, J. Lubar, F. Lotte, D. E. J. Linden, J. A. Lewis-Peacock, M. A. Lebedev, R. A. Lanius, A. Kübler, C. Kranczioch, Y. Koush, L. Konicar, S. H. Kohl, S. E. Kober, M. A. Klados, C. Jeunet, T. W. P. Janssen, R. J. Huster, K. Hoedlmoser, L. M. Hirshberg, S. Heunis, T. Hendler, M. Hampson, A. G. Guggisberg, R. Guggenberger, J. H. Gruzeli, R. W. Göbel, N. Gninenko, A. Gharabaghi, P. Frewen, T. Fovet, T. Fernández, C. Escolano, A.-C. Ehli, R. Drechsler, R. Christopher deCharms, S. Debener, D. De Ridder, E. J. Davelaar, M. Congedo, M. Cavazza, M. H. M. Breteler, D. Brandeis, J. Bodurka, N. Birbaumer, O. M. Bazanova, B. Barth, P. D. Bamidis, T. Auer, M. Arns & R. T. Thibault
Consensus on the Reporting and Experimental Design of Clinical and Cognitive-Behavioural Neurofeedback Studies (CRED-nf Checklist). *Brain*, **2020**, 143, 1674–1685

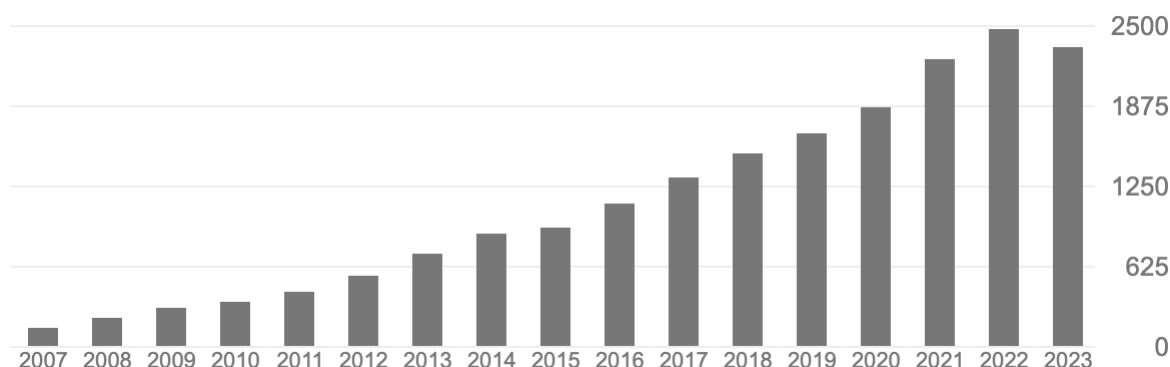
Brevets et inventions

US9757039B2 Patent "Functional optical coherent imaging", 2008

Indicateurs bibliométriques

Google Scholar du 15 novembre 2023

	All	Since 2018
Citations	19714	12141
h-index	62	50
i10-index	296	223



Plan de recherche

La neuroimagerie fonctionnelle chez l'humain a toujours bénéficié des avancées technologiques. En particulier, l'arrivée d'une IRM 7T dernière génération au Campus Biotech ouvre des opportunités pour acquérir des données à des résolutions spatiales inédites. L'utilisation des contrastes alternatifs au BOLD tels que VASO donne accès aux différentes couches de la matière grise et par conséquent à l'échelle mésoscopique de l'organisation cérébrale. Dans les prochaines années, je vais m'appuyer sur ces possibilités pour développer des connectomes fonctionnels à très haute résolution et leur fusion avec des données électrophysiologiques invasives telles que F-TRACT. Certaines de ces activités seront réalisées dans le cadre du projet Sinergia avec Patric Hagmann (CHUV) et Serge Vuilleumier (HUG). Notre expérience en imagerie de la moelle épinière à 3T va également nous servir pour le développement des

protocoles d'acquisition à 7T pour cette partie du système nerveux central.

Une autre modalité d'imagerie prometteuse est l'ultrason fonctionnel ultrarapide. Comme partenaire suisse du projet européen MICROVASC mené par Mickael Tanter, nous allons développer des techniques d'analyse pour caractériser la connectivité, chez l'animal et l'humain.

Au niveau méthodologique, j'ai un intérêt singulier pour étendre le traitement des données des graphes à des graphes dirigés. Plusieurs défis théoriques doivent être résolus avant que cette approche puisse être appliquée à la modélisation des réseaux cérébraux.

■ Collaborations scientifiques

De nombreuses collaborations avec des chercheuses et chercheurs à l'UNIGE ont vu le jour, notamment pour ma contribution en matière de méthodologie et d'analyse de données avancées. Ces collaborations ont mené à des publications en commun. Une liste non-exhaustive des collaborateurs avec le champ d'application : Emmanuel Carrera (AVC), Petra Hüppi (neuroimagerie pédiatrique), Sophie Schwartz (sommeil), Stephan Eliez (22q11 deletion syndrome), Serge Vuilleumoz (épilepsie), Fabienne Picard (épilepsie et état extatique), Panteleimon Giannakopoulos (démence), Patrik Vuilleumier et Camille Piguet (dépression), Pierre Burkhard et Vanessa Fleury (la maladie de Parkinson), Julie Péron et Frédéric Assal (COVID-19), Gilles Allali (démence).

■ Bourses et fonds de recherche

(Si pertinent, les montants attribués au laboratoire sont indiqués entre parenthèses)

- 2022-2026 SNSF Research Project, requérant, 668'810 CHF, Imaging and Modeling of Simultaneous Brain and Cervical Spinal Cord
- 2021-2023 Boninchi Foundation, requérant, 50'000 CHF, BrainCom
- 2023-2027 SNSF Sinergia, co-requérant avec Patric Hagmann (UNIL, requérant) et Serge Vuilleumoz (HUG, co-requérant), 2'796'351 CHF (615'523 CHF), Precision Mapping of Electrical Brain Network Dynamics with Application to Epilepsy
- 2022-2027 Horizon Europe Pathfinder Challenges, co-requérant avec Mickael Tanter (EPSCI, Paris, requérant) and consortium, 5'085'411 EUR (608'690 CHF), Remote Whole-Brain Functional Microscopy of the Vascular System: A Paradigm Shift for the Monitoring and Treatment of Small Vessel Diseases
- 2021-2023 PHRT Pioneer Imaging Project, co-requérant avec Michael Unser (EPFL, requérant), 499'984 CHF (216'992 CHF), Standardized Pipelines for the Accelerated Transfer of Advanced Imaging Software to Clinics
- 2020-2022 Bertarelli Foundation, co-requérant avec Paul Krack (Inselspital, requérant), Olaf Blanke (EPFL, co-requérant), et Vanessa Fleury (HUG, co-requérant), 297'349 CHF (26'368 CHF), Unraveling the Impact of Levodopa on Dysfunctional Brain Networks in Parkinson's Disease with Neuropsychiatric Fluctuations
- 2020-2023 SNSF NCCR, chercheur associé sous la direction de Balthasar Bickel (UZH), Anne-Lise Giraud et Daphné Bavelier (UNIGE), Klaus Zuberbühler (UniNE), 16'993'200 CHF (400'000 CHF), The Origins and Future of Language
- 2018-2021 SNSF Sinergia Grant, co-requérant avec Patrik Vuilleumier (UNIGE, requérant) et Ronan Boulic (EPFL, co-requérant), 2'150'667 CHF (619'275 CHF), Charting Emotion Components and Dynamics in the Human Brain using Virtual Reality and Cinema

- 2018-2021 Bertarelli Foundation, requérant avec Olaf Blanke (EPFL, co-requérant) et Paul Krack (HUG, co-requérant), 295'200 CHF (196'600 CHF), Novel biomarkers and therapeutics for hallucinations in Parkinson's disease using robotically-driven neurofeedback
- 2016-2020 SNSF Research Project, requérant, 327'825 CHF, Advanced Network Analysis to Study Brain Dynamics in Health and Disorder
- 2018-2019 Boninchi Foundation, requérant, 75'000 CHF, Understanding Neurodevelopmental Outcomes in Children and Adolescents with Agenesis of the Corpus Callosum using Structural and Functional Imaging
- 2018-2019 Zeiss Research IDEAS, requérant, 100'000 CHF, WormNets: Exploring C. Elegans Large-Scale Functional Networks Using Whole Animal 3D Light Microscopy
- 2017-2022 SNSF Research Project, requérant, 226'964 CHF, Graph Slepian Designs for Directed and Tunable Network Analysis
- 2017-2023 Wyss Center for Bio- and Neuro-Engineering, requérant avec Pascal Senn (HUG, co-requérant), 624'990 CHF, NeuroTin: Physiological Regulation of Chronic Tinnitus

■ Supervision scientifique et mentorat

Je dirige un groupe de recherche qui est constitué d'une quinzaine de chercheurs réparti entre doctorants, post-doctorants et visiteurs académiques. La proportion des doctorants fluctue autour de 50%. Certains des membres étaient financés par des subventions compétitives telles que SNSF Marie Heim-Vögtlin Fellowship, SNSF Ambizione Fellowship, Marie Skłodowska-Curie European Reintegration Grant, EuroTechPostdoc Programme, Korea Research Foundation Travel Grant.

Nombreux alumni du laboratoire ont poursuivi une carrière académique ou scientifique.

En académie :

- Frank Scharnowski: Full Professor, University of Vienna (Ambizione mentor)
- Yves Wiaux: Full Professor, Heriot Watt University, Edinburgh (post-doc mentor)
- Roy Salomon: Full Professor, University of Haifa (post-doc mentor)
- Elvira Pirondini: Assistant Professor, University of Pittsburgh (post-doc mentor)
- Fabiano Baroni: Assistant Professor, Autonomous University of Madrid (post-doc mentor)
- Zafer Dogan: Assistant Professor, Koç University, Istanbul (PhD supervisor)
- Hamdi Eryilmaz: Assistant Professor, Harvard Medical School (PhD mentor)
- Jonas Richiardi: Staff Scientist, University of Lausanne (post-doc mentor)
- Yury Koush: Associate Research Scientist, Yale University (post-doc mentor)
- Kirsten Emmert: Research Facilitator, Kiel University (PhD co-supervisor)
- Thomas Bolton: Post-doc, University of Lausanne (PhD supervisor)

En industrie :

- Djano Kandaswamy: CEO, aeChem Life Technologies Sàrl (PhD supervisor)
- Naghmeh Ghazaleh: Principal Data Scientist, Roche (PhD supervisor)
- Nora Leonardi: Global Lead L&H Claims Analytics, SwissRe (PhD supervisor)

- Lorena Freitas: Data Scientist, Janssen Pharmaceutica (PhD supervisor)
- Daniela Zöller: Scientist, Bosch Sensortec (PhD supervisor)
- Rotem Kopel: CEO, MindMatters (PhD supervisor)
- Jeffrey Kasten: Staff Software Imaging Scientist, Johnson & Johnson (PhD supervisor)
- F. Isik Karahanoglu: Associate Director, Early Clinical Development Biostatistics, Pfizer (PhD supervisor)
- Anjali Tarun: Data/ML Scientist, AI Exploitation & Innovation, Sunrise UPC (PhD supervisor)

■ Autres activités scientifiques

- 2020-2022 Président de la Société Suisse en bio-ingénierie (SSBE)
- 2017- Membre du comité d'évaluation SNSF Ambizione (Division II/MNIST)
- Membre du comité éditorial des journaux scientifiques dans le domaine de la neuroimagerie et du traitement des données : IEEE Transactions on Signal Processing, IEEE Signal Processing Magazine, SIAM Journal on Imaging Sciences, NeuroImage : Reports, Imaging Neuroscience
- Conférencier invité de la séance plénière inaugurale intitulée « Signals, Graphs, and Brains : An Interdisciplinary Tale » à EUSIPCO, Helsinki, Finlande, 4-8 septembre, 2023

■ Contributions à la science ouverte

Nos publications sont disponibles en libre accès selon les directives de l'institution et des bailleurs de fonds. La majorité de nos implémentations est également disponible dans des registres avec accès public. Selon les dispositions du comité d'éthique, les données sont mises à disposition dans les bases de données publiques.

■ Activités de vulgarisation

Les résultats de nos publications sont souvent diffusés dans des communiqués de presse. Nous participons également à des événements publics pertinents. Je suis également présent sur Twitter/X (@dvdevill) et je dispose d'une page Wikipedia (https://en.wikipedia.org/wiki/Dimitri_Van_De_Ville).

- « The Story of NeuroImage : Downfall and Revival », octobre 2023, Open Access Week
- « Un algorithme prédictif des maladies psychotiques », septembre 2021, <https://www.unige.ch/medias/en/2021/un-algorithme-predictif-des-maladies-psychotiques>
- « Les mystères du sommeil dévoilés grâce à l'IRM », janvier 2021, <https://actu.epfl.ch/news/les-mysteres-du-sommeil-devoiles-grace-a-l-irm/>
- « Une malformation illustre l'incroyable plasticité du cerveau », novembre 2020, <https://www.unige.ch/medias/en/2020/une-malformation-illustre-lincroyable-plasticite-du-cerveau>
- 2019 World Conference of Science Journalists, « Real-Time fMRI Demonstrator », Campus Biotech

■ Expérience d'enseignement

Mon activité d'enseignement se concentre sur des aspects méthodologiques de la neuroimagerie, y compris les bases fondamentales telles que le traitement des signaux et des images. Certains des cours enseignés à l'EPFL (Neural Signals and Signal Processing, Signal Processing for Functional Brain Imaging) sont également attractifs pour les doctorants de l'UNIGE, en particulier ceux inscrits dans l'École Lémanique en Neurosciences.

- 2020-2022 Guest lecture « Resting-State fMRI », Techniques for Investigating Brain Function (24N05), Master et Post-gradué, UNIGE (organisé par C. Michel)
- 2008, 2010, 2012, 2014, 2018 Advanced Topics in Functional MRI in Cognitive and Clinical Neuroscience, Lemanic Doctoral School in Neuroscience, UNIGE (avec P. Vuilleumier)
- 2011-2021 Signal Processing for Functional Brain Imaging (100%, MICRO-513, 3 ECTS), Master, EPFL
- 2011- Image Processing I (50%, MICRO-511, 3 ECTS), Master, EPFL (avec M. Unser)
- 2011- Image Processing II (66%, MICRO-512, 3 ECTS), Master, EPFL (avec M. Unser)
- 2022- Neural Signals and Signal Processing (66%, NX-421, 6 ECTS), Master, EPFL (avec S. Micera)

Supervision des MD-PhD à l'UNIGE

- 2023 Artificial Intelligence in Neurovascular Imaging, Jeremy Hofmeister
- 2023 Prédire la récupération fonctionnelle après un accident vasculaire cérébral ischémique grâce à la connectivité globale, Cyprien Rivier

Formation pédagogique et autre expertise pédagogique avérée

- 2019 Implicit Bias, Marianne Schmid Mast (UNIL)
- 2018 Research Integrity," Epigeum, UNIGE
- 2018 Avoid Plagiarism," MOOCS, UNIGE
- 2010 Effective Lecturing," Ingrid Le Duc, CRAFT-EPFL
- 2010 Course Design, Siara Isaac, CRAFT-EPFL

■ Développement d'outils et d'activités d'enseignement

Le matériel pédagogique de l'enseignement est principalement constitué de diapositives qui sont mises à disposition des étudiants par Moodle. Les cours ex-cathedra sont complétés avec des exercices et des projets pour lesquels une implication active des étudiants est attendue. Les exercices sont basés sur des Python Notebooks. Pour faciliter l'accès des étudiants aux outils nécessaires pour le traitement des données en imagerie, des Virtual Machines ont été configurées. Les résultats des projets sont présentés en groupe et aboutissent souvent à des discussions enrichissantes sur la théorie et la pratique des concepts enseignés.

■ Perspectives d'enseignement

Depuis 2022, je suis le Directeur de Section à l'EPFL pour la mise en place et la gestion d'un nouveau diplôme d'ingénieur « Master in Neuro-X ». L'intérêt pour ce Master par des étudiants de plusieurs programmes de Bachelor en ingénierie (p.ex. Life Science Engineering, Systems and Communications, Microengineering, Electrical Engineering) semble avéré, avec 47 étudiants qui ont démarré en 2022 et 74 en 2023. Beaucoup de ces étudiants sont intéressés par des projets de semestre et des projets de diplôme avec une pertinence clinique. En tant que directeur de section et étant familier avec les recherches de mes collègues à la Faculté de Médecine de l'UNIGE, je peux renseigner et guider ces étudiants de manière optimale.

■ Expérience de gestion

Ma priorité est le bien-être des membres de mon laboratoire, les doctorants et les post-doctorants. En plus du lab meeting hebdomadaire, je planifie très régulièrement des réunions individuelles avec chaque membre. Nous nous mettons d'accord sur les objectifs en fonction de différentes perspectives de carrière. Je maintiens activement une communication ouverte avec et entre les membres du laboratoire, tout en étant sensible à certains sujets délicats. Selon mon expérience, quand tout le monde se sent intégré, des événements sociaux émergent de manière spontanée. Notre dernière sortie du laboratoire s'est déroulée au European Space Agency (ESA) à Cologne où Dr. Raphaël Liégeois, ancien post-doctorant du laboratoire est maintenant astronaute professionnel et nous a accueilli et émerveillé avec une visite guidée du site.

■ Engagement au service de l'institution

Depuis son démarrage en 2005, je suis engagé dans la gestion et les activités du CIBM Centre d'Imagerie Biomédicale. Depuis 2015, je suis le responsable de la section « Signal Processing UNIGE-EPFL » qui œuvre pour le développement et la dissémination des techniques d'analyse de données selon les besoins des chercheurs et utilisateurs du CIBM. Depuis 2020, je suis également responsable ad-interim de la section « Animal & Imaging Technology EPFL » qui gère les IRMs 9.4T et 14T précliniques, et 7T humain, sur le site de l'EPFL.

Depuis 2015 mon laboratoire se trouve au Campus Biotech à Genève qui réunit des chercheurs en neurosciences de l'UNIGE et de l'EPFL. Je suis impliqué dans la gestion des plateformes, en particulier comme faculty advisor de la M/EEG facility et depuis mi-2023 comme président du Steering Committee pour l'IRM 7T. Je coordonne également l'équipe Siemens-CIBM qui appuie les utilisateurs de la 7T en termes d'optimisation et développement des protocoles d'acquisition.

Depuis 2018, je suis membre du bureau de la commission informatique (BuCIF) de la faculté de médecine, en particulier pour la liaison avec le Campus Biotech.

2 Liste des publications

Peer-reviewed scientific journal articles

- [1] H. Behjat, A. Tarun, D. Abramian, M. Larsson, and **D. Van De Ville**, “Voxel-wise brain graphs from diffusion MRI: Intrinsic eigenspace dimensionality and application to functional MRI”, *IEEE Open Journal of Engineering in Medicine and Biology*, in press. DOI.
- [2] S. Leserri, A. Segura-Amil, A. Nowacki, I. Debove, K. Petermann, L. Schäppi, M. G. Preti, **D. Van De Ville**, C. Pollo, S. Walther, and T. A. K. Nguyen, “Linking connectivity of deep brain stimulation of nucleus accumbens area with clinical depression improvements – a retrospective longitudinal case series”, *European Archives of Psychiatry and Clinical Neuroscience*, in press.
- [3] E. Morgenroth, L. Vilaclara, M. Muszynski, J. Gaviria, P. Vuilleumier, and **D. Van De Ville**, “Probing neurodynamics of experienced emotions: A hitchhiker’s guide to film fMRI”, *Social Cognitive and Affective Neuroscience*, in press.
- [4] **D. Van De Ville** and R. Liégeois, “Dynamic functional connectivity to tile the spatiotemporal mosaic of brain states”, *Imaging Neuroscience*, in press.
- [5] M. Miri, V. Abootelebi, H. Saeedi-Sourck, **D. Van De Ville**, and H. Behjat, “Spectral representation of EEG data using learned graphs with application to motor imagery decoding”, *Biomedical Signal Processing and Control*, vol. 87, p. 105 537, 2024. DOI.
- [6] T. B. Bolton, **D. Van De Ville**, E. Amico, and R. Liégeois, “The arrow-of-time in neuroimaging time series identifies causal triggers of brain function”, *Human Brain Mapping*, vol. 44, pp. 4077–4087, 10 2023. DOI.
- [7] F. Delavari, H. Rafi, C. Sandini, R. J. Murray, C. Latrèche, **D. Van De Ville**, and S. Eliez, “Amygdala subdivisions exhibit aberrant whole-brain functional connectivity in relation to stress intolerance and psychotic symptoms in 22q11.2DS”, *Translational Psychiatry*, vol. 13, 145 2023. DOI.
- [8] N. Kinany, A. Khatibi, O. Lungu, J. Finsterbusch, C. Büchel, V. Marchand-Pauvert, **D. Van De Ville**, S. Vahdat, and J. Doyon, “Decoding cerebro-spinal signatures of human behavior: Application to motor sequence learning”, *NeuroImage*, vol. 275, p. 120 174, 2023. DOI.
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