# Hugo Soulat

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**PROFILE**

I am a third year PhD student in Computational Neuroscience and Machine Learning at Gatsby Unit where I use and develop mathematical and statistical tools to address brain related questions. I am currently working under the supervision of Prof. Maneesh Sahani on the modeling of neural population spike trains. Before starting my PhD, I obtained two master degrees in systems engineering and bioengineering from École Polytechnique (France) and EPFL (Switzerland) after which I worked 2 years in Emery Brown's Neuroscience Statistics Research Laboratory (Harvard/MIT- USA) as a data analyst and research assistant.

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**EDUCATION**

*Gatsby Computational Neuroscience Unit (London, UK)* 2019 - now
PhD student in Computationnal Neuroscience and Machine Learning.

*Harvard Medical School - MIT (Boston, USA)* 2017 - 2018
1 year master project in Neuroscience Statistics and data analysis.

*EPFL (Lausanne, Switzerland)* 2016 - 2018
Double master degree of science in Systems Bioengineering GPA 3.8/4

*École Polytechnique (Paris, France)* 2013 - 2017
Master degree of science in Biophysics and Mathematics GPA 3.86/4

*Lycée Louis Le Grand, (Paris, France)* 2011- 2013
Intensive two-year preparatory course in mathematics and physics for the competitive entrance exams to top French engineering schools GPA 4/4

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**EXPERIENCE**

*Data Analyst (with Prof. Patrick Purdon and Prof. Emery Brown)* 2018 - 2019
Neuroscience Statistics Research Laboratory. MIT - HMS (Boston, USA)

- EEG time series modeling for the characterization of human subject anesthetized state using cross frequency coupling.
- Statistical inference.

*Master Project (with Prof. Patrick Purdon and Prof. Emery Brown)* 2017 - 2018
Neuroscience Statistics Research Laboratory. MIT - HMS (Boston, USA)

- Simultaneous EEG-fMRI analysis.
- Design Expectation Maximization and Kalman filtering algorithms.

*Research Internship (with Dr. Gaël Moneron and Prof. David DiGregorio)* 2016
Unit of Dynamic Neuronal Imaging. Pasteur Institute (Paris, France)

- Designed and Built a Fluorescence Correlation Spectroscopy (FCS) microscope
- Designed and implemented FCS Experiments
- Implemented numerical simulations tools assessing the experiments validity.

*Junior engineer* May 2015 - July 2015
Techno Scientific Inc. (Toronto, Canada)
- Studied and characterized materials for biomedical applications

*Human/military formation (as part of École Polytechnique training)* 2013 - 2014
French Air Force officer training school
- Participated in training missions and drew up internal audit reports..

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**DISTINCTIONS**

NeurIPS *spotlight* 2021
Our work on probabilistic tensor decomposition [1] was selected for a spolight presentation at NeurIPS 2021 (less than 3% of submissions).

*Bertarelli Fellowship* 2017-2018
Bertarelli Foundation and EPFL annually selects three to five students to perform their master's research in Harvard Medical School (HMS) or HMS-affiliated labs over a ten to twelve month period.

*Master Degree Excellence Mention* 2018
Awarded for student whose master studies average exceeds 5.5/6 (GPA>3.7).

*EPFL Excellence Fellowship* 2016
Awarded to students with outstanding academic records.

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**TEACHING**

*Probabilistic and Supervised Learning*
Teaching Assistant. Master Level Machine Learning Class.

*Systems and Theoretical Neuroscience*
Teaching Assistant. Master Level Neuroscience Class.

*Approximate Inference and Learning in Probabilistic Models*
Teaching Assistant. Master Level Machine Learning Class.

*In2scienceUK*
Volonteer Mentor. Social mobility and diversity program.

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**TECHNOLOGY LANGUAGES SKILLS**

*Languages:* English, French.
*Programming Languages:* Matlab, Python, Java, Tex, Processing, Mapple.
*Software:* Microsoft Office, FSL, Comsol Multiphysics, Sketchup, TeXMaker.

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**PUBLICATIONS**

[1] **Soulat,H.**, Keshavarzi,S., Margrie, TW. & Sahani, M. (2021) "Probabilistic Tensor Decomposition of Neural Population Spiking Activity." *Advances in Neural Information Processing Systems* 34 (accepted with **spotlight**).

[2] Gutiérrez, R. G., Egaña, J. I., Maldonado, F. A., Sáez, I. A., Reyes, F. I., **Soulat,H.**, Purdon, PL., & Penna, A. (2021) "Association between lower preoperative cognition with intraoperative electroencephalographic features consistent

with deep states of anesthesia in older patients: an observational cohort study.“ *Anesthesia & Analgesia*, 133(1), 205-214.

[3] Beck, A., **Soulat, H.**, Stephen ,E. , Purdon, PL. (2020), I-116. “State space oscillator models to identify and parameterize oscillatory signals in EEG“ (2020) *COSYNE*.

[4] **Soulat, H.**, Beck, A., Stephen ,E. , Purdon, PL. (2020), I-116. “State space methods for phase amplitude coupling analysis“. (2019) *bioRxiv*: 772145.

[5] Song, AH. , Chlon L., **Soulat, H.** , Tauber,J. , Subramanian, S., Ba, D , Prerau, MJ. (2019)” *Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). IEEE*

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**INTERESTS** World health and politics, scuba diving, basketball, piano, life and basic sciences.