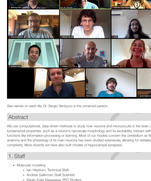
Computational Neuroscience Unit (Erin De Schutter)

FY2020 Annual Report

Computational Neuroscience Unit
Professor Erin De Schutter



Back homes on week 46. Dr. Sergio Verduzco is the unnamed person.

Abstract

We use computational, data-driven methods to study how neurons and microcircuits in the brain operate. We are interested in how microcircuits generate rhythmic activity and how this activity is modulated by neuromodulators. We also study how cerebellar microcircuits facilitate the information processing in learning. Most of our modeling focuses on the cerebellum as the brain structure has a relatively simple anatomy and the physiology of the main neurons has been studied extensively, allowing for detailed modeling of many different levels of complexity. More recently we have also built models of hippocampal synapses.

1. Staff

- Molecular modeling:
  - Sam Vaughan, Technical Staff
  - Sergio Verduzco-Flores, Staff Scientist
  - Sarah Sofie Nedergaard, PhD Student
- Cellular modeling:
  - Erin De Schutter, Group Leader
  - Anasu Mangiulina, Postdoctoral scholar
  - Gabriela Cejas Rangel, Postdoctoral scholar
  - Audrey Dyson, Postdoctoral scholar
- Network modeling:
  - Sergio Verduzco, Postdoctoral scholar (till October 2020)
  - Marina Mikulina, Staff Scientist (till September 2020)
  - Micah Kalex, PhD Student
- Data analysis:
  - Shelley Chen, Staff Scientist
  - Julia Lefkowitz, Postdoctoral scholar
- Technical support:
  - Hiromi Arai, Team Medical Unit
  - Samuel Morales, EPS
  - Ryan Ness, EPS
  - Yessenia Chenes, EPS
  - Giacomo Castagnolo, EPS
  - Yoshiko Ikuno, Okinawa University Graduate School of Medicine
  - Yoshiko Fujita, Okinawa University
- Visiting Research Student:
  - Ryuichi Tanigawa, Yamaguchi University School of Medicine
- Research Intern:
  - Haruki Shigita, Tohoku University School of Medicine
- Rotation Students:
  - Maria Papadopoulou (Sem 1)
  - Ryan Ness (Sem 1)
  - Jose Andres Tapia Mora (Sem 2)
- Research Unit Administrator:
  - Chie Nawa

2. Collaborations

- **Theme: Cerebellar physiology, multiple themes**
  - Type of collaboration: Scientific collaboration and graduate program development
  - Researchers:
    - Professor M. Englund, University of Gothenburg, Sweden and SODRA, Sweden
    - Professor D. Sultanov, University of Helsinki, Finland
- **Theme: Signaling activity of monkey cerebellar neurons**
  - Type of collaboration: Scientific collaboration
  - Researchers:
    - Professor H.P. Thier, University of Tübingen, Germany
    - Akshay Markanday, University of Tübingen, Germany
    - Mitsuo Kawato, ATR, Kyoto, Japan
    - Peter Dicke, University of Tübingen, Germany
- **Theme: Human Brain Project simulator development**
  - Type of collaboration: Scientific collaboration
  - Researchers:
    - Prof. E. Schonbach, Ecole Polytechnique Fédérale de Lausanne, Switzerland
    - Dr. T. Sakai, Ecole Polytechnique Fédérale de Lausanne, Switzerland
    - Dr. S. Gerdjikov, Ecole Polytechnique Fédérale de Lausanne, Switzerland
    - Dr. F. Ramos, Ecole Polytechnique Fédérale de Lausanne, Switzerland
- **Theme: Molecular identification of cerebellar signaling pathways and cerebellar synaphenotics**
  - Type of collaboration: Scientific collaboration
  - Researchers:
    - Professor K. Tanaka, Kansai Institute for Science and Technology (KIST), Kansai
- **Theme: Quantitative molecular identification of hippocampal synapses**
  - Type of collaboration: Scientific collaboration
  - Researchers:
    - Prof. Dr. Silvio O. Rizzoli, Medical University Göttingen, Germany
- **Theme: Cerebellar molecular layer interneurons**
  - Type of collaboration: Joint research
  - Researchers:
    - Professor Alain Marty, Universite Paris 5 René Descartes, France
- **Theme: Cerebellar anatomy and physiology**
  - Type of collaboration: Scientific collaboration
  - Researchers:
    - Professor C. De Zeeuw, Erasmus Medical Center, Rotterdam, The Netherlands
    - Professor L.W.J. Bosman, Erasmus Medical Center, Rotterdam, The Netherlands
    - Dr M. Negrello, Erasmus Medical Center, Rotterdam, The Netherlands
- **Theme: Purkinje cell morphology and physiology, modeling**
  - Type of collaboration: Scientific collaboration
  - Researchers:
    - Professor J. Mugnaini, Yale University School of Medicine, USA
    - Professor P. Jonas, Universität Freiburg, Germany, Germany, Germany