# Nicolas Sommer

Robotics and Machine Learning

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## Education

### EPFL

*Lausanne, Switzerland*

PhD in Robotics, Control and Intelligent Systems — *December 2012 -- May 2017*

- Thesis title: *Multi-contact tactile exploration and interaction with unknown objects*

Msc, Microengineering *Robotics and Autonomous Systems* — *2010 -- 2012*

- Thesis title: *Learning with tactile feedback on a humanoid robot*
- Double-degree between EPFL (Switzerland) and INSA (France)

### INSA

*Strasbourg, France*

Msc, Mechatronics — *2006 - 2011*

- Thesis Project: Design of an embedded quadrotor controller

## Professional Experience

### Doctoral researcher at the Learning Algorithms and Systems Laboratory

*Lausanne , Switzerland*

EPFL — *2011 - 2015*

- Research
  - Developed an algorithm to assist hand amputees for the control of robotic hand prosthesis
  - Developed an active compliance controller to provide robots the ability to interact with unknown environments using touch
  - Developed a bimanual exploration algorithm for humanoid robots
  - Developed an algorithm for robots to learn from demonstrations using external sensing such as touch or force-torque information
- Projects
  - NCCR Robotics
  - Roboskin
- Other activities
  - Supervision of student's master thesis
  - In charge of IT administration in the lab (15 persons)

### Teaching assistant for graduate-level courses (Master and PhD level)

*Lausanne , Switzerland*

EPFL — *2011 - 2015*

Topics: Dimensionality reduction, Unsupervised learning, Clustering, Classification, Regression

- MICRO-570 Advanced Machine Learning (Spring 2012..2015)
- MICRO-455 Applied Machine Learning (Fall 2011..2015)

## Honors & Awards

Oct 2016 **Editor's choice, In other journals**, Science Magazine — *AAAS, USA*

Feb 2015 **Winner**, Lausanne startup weekend — *Lausanne, Switzerland*

July 2007 **Highest honours**, High school diploma — *Strasbourg, France*

## Skills

### Control and Tactile Exploration

Expert with several years of experience primarily with applications in robotics

- Dynamical system based motion planning
- Linear control (PID, RST) and Model predictive Control

### Machine Learning

Expert knowledge and experience of a wide range of algorithms for regression, clustering and classification

- Dimensionality reduction and structure discovery (PCA, Kernel PCA, LDA, CCA, ICA, Kernel ICA, etc)
- Linear and Non-linear regression (GMR, GP, LWPR, SVR, Neural Networks, etc)
- Linear and Non-linear clustering and classification (GMM, SVM, K-means, KNN, etc)
- Time series modelling (Markov chains, HMM)
- Reinforcement learning, Bagging, Boosting

### Computer Skills

- C/C++, Python, Matlab
- Distributed version control systems and continuous integration: bzr, git, Travis
- Robotic interfaces: ROS, YARP, Gazebo, Orocos
- Machine learning interfaces: Scikit-learn (Python), ML_Demos
- Miscellaneous: LaTeX, UNIX/Linux, Bash, Windows, Mac, Adobe suite, Microsoft Office suite

### Robotic Platforms

- Robotic manipulators and humanoids robots: KUKA LWR 4+ and IIWA, Barret WAM arm, iCub
- Hands: Wonik AllegroHand
- Tactile and force-torque sensors: Tekscan, Biotac, iCub's, Ati

### Mechanical and Electronic conception

- Circuit design: Altium Designer
- Computed assisted design: SolidWorks, ProEngineer
- Microcontroller programming: MicroChip DsPic, Arduino, Raspberry Pi

### Language

- French Native
- English Bilingual proficiency
- German Elementary proficiency
- Spanish Elementary proficiency

## Academic activities

### Journal Articles

[1] **Sommer, N.**, Billard, A., 'Multi-contact haptic exploration and grasping with tactile sensors'. In: *Robotics and Autonomous Systems* (2016).

### Conference Proceedings

[2] **Sommer, N.**, Billard, A., 'Face classification using touch with a humanoid robot hand'. In: *2012 12th IEEE-RAS International Conference on Humanoid Robots (Humanoids)*. 2012.

[3] **Sommer, N.**, Li, M., Billard, A., 'Bimanual compliant tactile exploration for grasping unknown objects'. In: *2014 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2014.

[4] Gerratt, A. P., **Sommer, N.**, Lacour, S. P., Billard, A., 'Stretchable capacitive tactile skin on humanoid robot fingers—First experiments and results'. In: *2014 IEEE-RAS International Conference on Humanoid Robots*. IEEE, 2014.

[5] **Sommer, N.**, Kronander, K., Billard, A., 'Learning Externally Modulated Dynamical Systems'. In: *2017 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2017.

### Workshop presentations and abstracts

[6] **Sommer, N.** *Tactile exploration with the iCub robot*. Presented at the iCub and friends Workshop, ICRA 2014. Hong-Kong, 2014.

[7] **Sommer, N.** *Face Classification using Touch with a Humanoid Robot.* Presented in the Second Workshop on Advances in tactile sensing and touch-based human-robot interaction, IROS 2012. Villamoura, Portugal, 2012.

[8] Zhuang, K., **Sommer, N.**, Formento, E., D'Anna, E., Billard, A., Micera, S., *Grasp smarter, not harder: Proportional control of an electromyographic prosthesis with a touch of automation*. Neuroscience 2017. Washington DC, USA, 2017.

### Reviewer experiences

- IEEE International Conference on Robotics and Automation
- IEEE/RSJ International Conference on Intelligent Robots and Systems
- IEEE-RAS International Conference on Humanoid Robots
- Robotics: Science and Systems
- International Journal of Humanoid Robotics
- PlosOne

## Media appearances

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| 23 September 2016 | **Can you feel what I feel?**, Science Magazine, Editor's choice | *AAAS, USA* |
| 15 June 2016 | **Le robot, un allié ou un rival?**, *Vacarme*, RTS radio | *Lausanne, Switzerland* |
| 23 October 2015 | **Minimag**, RTS TV | *Lausanne, Switzerland* |
| 19 October 2013 | **Ein Roboter wie ein Kleinkind**, SRF radio | *Zürich, Switzerland* |