

# NEELES KUMAR

CBIM 05 ◊ 617 Bowser Rd, Piscataway, NJ 08854

nk525@cs.rutgers.edu

## RESEARCH INTERESTS

---

Machine Learning for EEG, Rehabilitation Robotics, Reinforcement Learning

## EDUCATION

---

<b>Ph.D Computer Science</b> Rutgers University, New Brunswick, NJ Advisor: Dr. Konstantinos P. Michmizos	Sep 2017 - Present GPA: 4.0/4.0
<b>M.S. Computer Science</b> Rutgers University, New Brunswick, NJ Advisor: Dr. Konstantinos P. Michmizos Thesis: Vision-based Cognitive Fatigue Detection	Sep 2015 - May 2017 GPA: 3.86/4.0
<b>B.Tech Information Technology</b> JSS Academy of Technical Education, Noida, India	Aug 2011 - June 2015 GPA: 9/10

## PUBLICATIONS

---

- **Kumar N**, Michmizos K.P. (2022), A Neurophysiologically Interpretable Deep Neural Network Predicts Complex Movement Components from Brain Activity. *Nature Scientific Reports*.
- Tang G, **Kumar N**, Polykretis I, Michmizos K. (2021), BioGrad: Biologically Plausible Gradient-Based Learning for Spiking Neural Networks. *Arxiv*.
- **Kumar N**, Michmizos K.P. (2020), Machine Learning for Motor Learning: EEG-based Continuous Assessment of Cognitive Engagement for Adaptive Rehabilitation Robots. *IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob)*, New York City, NY.
- **Kumar N**, Michmizos K.P. (2020), Deep Learning of Movement Intent and Reaction Time for EEG-informed Adaptation of Rehabilitation Robots. *IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob)*, New York City, NY.
- Tang G, **Kumar N**, Yoo R, Michmizos K. (2020). Deep Reinforcement Learning with Population-Coded Spiking Neural Network for Continuous Control. *Conference on Robot Learning (CoRL)*, Cambridge, MA.
- Tang G, **Kumar N**, Michmizos K. (2020). Reinforcement co-Learning of Deep and Spiking Neural Networks for Energy-Efficient Mapless Navigation with Neuromorphic Hardware. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Las Vegas, NV.
- **Kumar N**, Trivedi C, Wang L, Michmizos K.P. (2017), Camera-based detection of the early stages of fatigue: Validation with meg and self-assessment data. *Cognitive Computational Neuroscience*, New York City, NY.

## WORKSHOPS

---

- **Kumar N**, Rassouli M, Banga K, Michmizos K.P. (2019), EEG-informed Machine Learning of Movement Primitives for Neurorehabilitation Robots. *American Society of Neurorehabilitation (ASNR)*, Chicago, IL.
- **Kumar N**, Georgiou N, Michmizos K.P. (2018), Convergence of Biological and Artificial Learning: Electroencephalography-Informed Adaptation of Neurorehabilitation Robots to Maximize Cognitive Engagement. *American Society of Neurorehabilitation (ASNR)*, San Diego, CA.

## RESEARCH PROJECTS

---

### **Deep Learning informed Adaptation of Neurorehabilitation Robots**

- Deep learning methods for continuous prediction of movement kinematics and patient engagement using objective brain signals (EEG). The framework can be used for real-time adaptation of task components in robotic therapy (Nature Scientific Reports 2021, Biorob 2020(a), Biorob 2020(b), ASNR 2019, ASNR 2018).

### **Deep Reinforcement Learning with Spiking Neural Network**

- Combine the energy-efficiency of spiking neural networks with the optimality of deep reinforcement learning to learn policies for robot planning and control and deploy on neuromorphic processor. (CoRL 2020, IROS 2020)

## WORK EXPERIENCE

---

### **Teaching Assistant**

Sep 2017 - Sep 2019

*Rutgers University*

Pattern Recognition; Computer Vision; Background Math for Computer and Data Science; Introduction to Artificial Intelligence; Brain-Inspired Computing

### **Machine and Robotics Vision Intern**

June 2016 - September 2016

*Trumpf Photonics*

- Developed laser beam inspection software for laser collimation, designed and developed software for vision guided pick and place robot in LabVIEW, developed software for automated glue dispensing using vision in LabVIEW.

## COURSES

---

Pattern Recognition, Theoretical Foundations of Deep Learning (Princeton University), Machine Learning, Computer Vision, Cognitive Science, Algorithms

## SKILLS

---

**Languages:** Python, Matlab, R, Java

**Frameworks:** PyTorch, Python-MNE, OpenCV

## ACADEMIC SERVICES

---

Peer reviewer for CVPR (2018), NeurIPS (2020), BioRob (2020), EMBC (2018-20)