

*Where Industry and Academia Meet*

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**EI18: INTRODUCTION TO PROBABILISTIC MODELS FOR INFERENCE AND ESTIMATION****Instructor:** Gaurav Sharma, University of Rochester (US) | **Thursday February 01**, 8:30 AM – 12:45 PM | **Course Level:** Introductory**Fee:** Member: \$275/ Non-member: \$300 / Student: \$95 (\*prices for all increase by \$50 after January 8, 2018)

The course aims at providing attendees a foundation in inference and estimation using probabilistic models. Starting from the broad base of probabilistic inference and estimation, the course develops the treatment of specific techniques that underlie many current day machine learning and inference algorithms. Topics covered include a review of concepts from probability and stochastic processes, IID and Markov processes, basics of inference and estimation, Maximum A Posteriori Probability (MAP) and Maximum Likelihood (ML), expectation maximization for ML estimation, hidden Markov models, and Markov and conditional random fields. The pedagogical approach is to illustrate the use of models via concrete examples: each model is introduced via a detailed toy example and then illustrated via one or two actual application examples.

**Benefits:**

- Describe and intuitively explain fundamental probabilistic concepts such as independence, Bayes' rule, and stationarity.
- Explain the basis of Maximum A Posteriori Probability (MAP) and Maximum Likelihood (ML) detection and estimation rules.
- Describe how latent variables and sequential dependence underlie expectation maximization and hidden Markov Models.
- Develop simple applications of probabilistic models for computer vision and image processing problems.
- Cite and explain application examples involving the use of probabilistic models in computer vision, machine learning, and image processing.

**Intended Audience:** Engineers, scientists, students, and managers interested in understanding how probabilistic models are used in inference and parameter estimation problems in today's machine learning and computer vision applications and in applying such models to their own problems. Prior familiarity with the basics of probability and with matrix vector operations are necessary for a thorough understanding, although attendees lacking this background will still be able to develop an intuitive high-level understanding.

**Instructor:** **Gaurav Sharma** has more than two decades of experience in the design and optimization of color imaging systems and algorithms that spans employment at the Xerox Innovation Group and his current position as a professor at the University of Rochester in the departments of electrical and computer engineering and computer science. Additionally, he has consulted for several companies on the development of new imaging systems and algorithms. He holds 51 issued patents and has authored more than a 190 peer-reviewed publications. He is the editor of the *Digital Color Imaging Handbook* published by CRC Press and served as the editor-in-chief for the *Journal of Electronic Imaging* (2011-2015). Sharma is a fellow of IS&T, IEEE, and SPIE.

**SYMPOSIUM PLENARY TALKS**

**Monday:** Overview of Modern Machine Learning and Deep Neural Networks – Impact on Imaging and the Field of Computer Vision, **Greg Corrado, co-founder of Google Brain and Principal Scientist at Google**

**Tuesday:** Fast, Automated 3D Modeling of Buildings and Other GPS Denied Environments, **Avideh Zahkor, Qualcomm Chair & Professor at UC Berkeley**

**Wednesday:** Ubiquitous, Consumer AR Systems to Supplant Smartphones, **Ronald T. Azuma, Intel Labs Researcher and Augmented Reality Pioneer**

**SYMPOSIUM HIGHLIGHTS**

- 18 conferences featuring 30 keynote talks by world reknown experts
- 3D Theatre
- Tours of Stanford University Labs
- Industry Exhibition
- Meet the Future: Showcase of Student and Young Professional Research
- Demonstration Session
- Poster Session
- Welcome Reception
- Women in Electronic Imaging Breakfast
- Human Vision in Electronic Imaging 30<sup>th</sup> Year Banquet

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