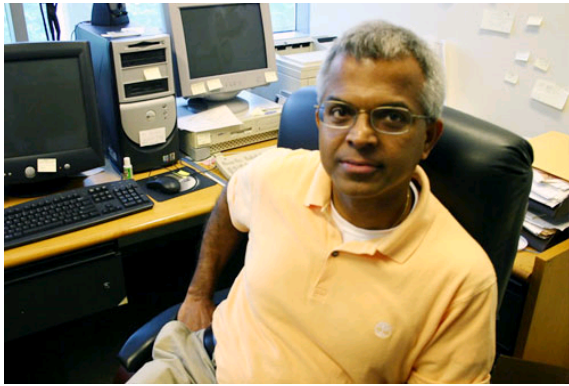


Faculty in Signal Processing

- **Unnikrishna Pillai:** Array processing, system identification, spectral estimation; applications to radar and sonar.
 - <http://eeweb.poly.edu/pillai/>
- **Ivan Selesnick:** Signal and image restoration and noise reduction, wavelet transforms, biomedical signal and image processing, digital audio
 - <http://taco.poly.edu/selesi/>
- **Yao Wang:** Video and image compression, video communication over networks, video streaming, medical imaging
 - <http://eeweb.poly.edu/~yao>

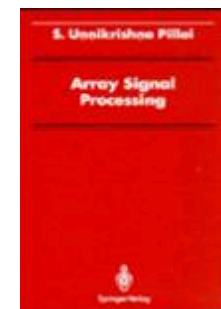
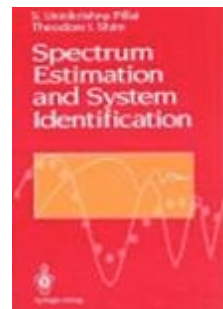
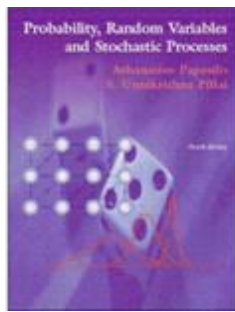


S. Unnikrishna Pillai

<http://eeweb.poly.edu/pillai/>

■ Current projects

- Joint Transmitter-Receiver Design in Clutter and Noise
- Adaptive Array Processing for Mobile Communications
- Blind Identification and Deblurring of Blurred Images
- Spectrum Estimation and System Identification
- Stable and Rational Approximation of Nonrational Systems





Ivan Selesnick

<http://taco.poly.edu/selesi/>

■ Current projects

- Probability Models and Wavelet-Based Denoising
- Design of Wavelet Transforms
- Video Coding using a 3-D Motion-Selective Wavelet Transform

Research Projects in Video Communications and Medical Imaging



Yao Wang
Electrical and Computer Engineering
Polytechnic University of NYU
Brooklyn, NY 11201
vision.poly.edu

Cross layer optimization for networked video applications

- Perceptual quality assessment considering packet loss, variable frame rates and frame sizes
- Complexity modeling of video encoding and decoding
- Scalable video adaptation under rate and energy constraints
- Joint adaptation of transmission power and video encoding to minimize total energy consumption
 - With David Goodman and Elza Erkip
- Cooperative video communications: unicast and multicast
 - With Shivendra Panwar and Elza Erkip
- Transmission of layered video using diversity-embedded space-time codes
 - With Elza Erkip
- Peer-To-Peer Video Streaming
 - With Keith Ross (CIS), Shivendra Panwar (ECE) and Yong Liu (ECE)

Medical image processing

- Image reconstruction from under-sampled parallel MRI data using compressive sensing
 - Joint with D. Sodickson et al., NYU Medical School, I. Selesnick, NYU-Poly ECE
- Radiation treatment planning for breast cancer
 - Prediction of optimal treatment position (prone vs. supine) based on CT scan data from one position
 - Joint with S. Formenti, J. Chang et al, NYU Medical School, E. K. Wong, NYU-Poly CSE

Courses in Signal Processing

EL **5123** Image Processing
EL **5143** Multimedia Laboratory
EL **5823** Medical Imaging I
EL **6823** Medical Imaging II
EL **6113** Signals, Systems and Systems
EL **6123** Video Processing
EL **6183** Digital Signal Processing Lab
EL **7133** Digital Signal Processing
EL **7163** Wavelet Transforms and Filter Banks

New:

EL **9123** Biomedical Instrumentation
EL **9133** Biomedical Signal Processing

Also Recommended:

EL **6303** Probability Theory
EL **6313** Stochastic Processes
EL **6333** Detection and Estimation Theory

Notes: courses with middle number “1” are in signal processing.

Sequences:

EL 6113 - EL 7133 (signals, DSP)

EL 5123 - EL 5823 (biomedical imaging)

EL 5123 - EL 6123 (image and video processing)

EL 7133 - EL 6183 (DSP + DSP Lab)

EL 7133 - EL 7163 (DSP + wavelet transforms)

EL 7133 or 6183 - EL 9123 (DSP + biomedical instrumentation)

EL 7133 - EL 9133 (DSP + biomedical signal processing)

other sequences also...

It is recommend that the students take EL5143 multimedia lab if they do not plan to take both EL5123 and EL6123, but would like to get exposure to audio/image/video processing (and video streaming). (It is OK to take EL5143 and one of EL5123 and EL6123, overlap will not be significant).

Many of the courses in SP use MATLAB

Find Matlab tutorials on the web at:

http://taco.poly.edu/selesi/EL713/zoom/matlab_tutorials.zip

* Qualified students may skip EL 6113 and go directly into EL 7133 in which case EL 7133 can be used as a core course.

Suggested Courses for MSEE with focus on Digital Signal Processing (DSP)

Semester	Number	Title	Credits
1st	EL 6253	Linear Systems	3
	EL 6303	Probability	3
	EL 6113*	Signals and Systems	3
2nd	EL 7133	Digital Signal Processing	3
	EL 6183	DSP Lab	3
	EL 6313	Stochastic Processes	3
3rd	EL 5123	Image Processing	3
	EL 7133	Wavelets and Filter Banks	3
	EL 9133	Biomedical Signal Processing	3
4th	EL 995	Advanced Project	3
Total	10 Courses		30

Job opportunities:

DSP is used many telecommunication and device companies (Motorola, Texas Instruments, Philips, Mitsubishi Electric, Sharp, Sony, General Electric, etc)

MS thesis:

Students may complete an MS thesis (EL 997, 6 credits) instead of EL 995 and any course in the third semester.

Suggested Courses for MSEE while focusing on Image Processing

Semester	Course number	Time	Course title	Credit
1st Semester	EL5123		Image Processing	3
	EL6303		Probability	3
	EL6113		Signals and systems	3
2nd Semester	EL6123		Video processing	3
	CS6643		Computer Vision	3
	EL7133		Digital signal processing	3
	or EL6313		Stochastic processes	
3rd Semester	EL6253		Linear systems	3
	Choose 2 from list of electives			6
4th Semester	Choose 1 from list of electives (can be taken in the summer to finish in 1.5 year)			3
Total	10 Courses			30 Credits

Job opportunities:

Companies or research labs designing or operating imaging and video systems (Philips, Thomson, HP, IBM, TI, Mitsubishi Electric, Apple, Sharp, Sony, etc)

Network service or equipment providers and their research labs (AT&T, Verizon, Cisco, Qualcomm)

Medical imaging equipment providers (GE, Siemens, Philips, etc.)

Startups offering video services (video surveillance, video streaming, etc.)

Image Processing Certificate

- **Require 4 courses, can be taken as part of MSEE Program, or just for the certificate**
- **Required Courses**
 - EL 5123 Image Processing, Credits: 3.00
 - EL 6123 Video Processing, Credits: 3.00
 - CS 6643 Computer Vision And Scene Analysis, Credits: 3.00
- **Electives:** Choose 1 from the following list:
 - EL 5823 Medical Imaging I, Credits: 3.00
 - EL 6183 Digital Signal Processing Laboratory, Credits: 3.00
 - EL 6113 Signals, Systems And Transforms, Credits: 3.00
 - EL 6303 Probability Theory, Credits: 3.00
 - EL 6313 Stochastic Processes, Credits: 3.00
 - EL 7133 Digital Signal Processing, Credits: 3.00
 - EL 7163 Wavelet Transforms And Filter Banks, Credits: 3.00
 - EL 9953 Advanced Projects I, Credits: 3.00
- **Contact:** Yao Wang, yao@poly.edu

Biomedical Signal Processing

- We offer a number of courses in this area
 - EL5823 Medical Imaging I
 - EL9123 Biomedical Instrumentation Lab
 - EL9133 Biomedical Signal Processing
- Possible sequences
 - EL5123 – EL5823: Medical image processing
 - EL713 or EL6183 – EL 9123: Biomedical instrumentation
 - EL713 – EL9133: Biomedical signal processing
- Please also consults courses in the MS BME program