Eymen Kurdoglu

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Profile

– Worked on both theoretical analysis and development of real-time video communication systems.
– Enthusiastic about projects that involve probabilistic modeling & analysis and scaling.

Research Interests

Computer Networks | Video Coding/Processing | Statistical Inference | Optimization

Education

PhD in Electrical & Computer Engineering Jan 2012 - May 2017
New York University Tandon School of Engineering, Brooklyn, NY *GPA: 3.91/4.0*
Advisors: Prof. Yao Wang, Prof. Yong Liu

MS in Computer & Communication Sciences 2012-2015
EPFL, Lausanne, Switzerland *GPA: 5.17/6.0*
Advisor: Prof. Pascal Frossard

BS in Electrical & Electronics Engineering 2003-2007
Middle East Technical University, Ankara, Turkey *GPA: 3.6/4.0*
BS in Physics (Double major programme) 2004-2008
Middle East Technical University, Ankara, Turkey *GPA: 3.75/4.0*

Internship Experience

NEC Labs America, Princeton, NJ Summer 2013
Optical Networking Group
– Worked on the convergence of the optical transport and IP networks, where the goal was to compare the traditional GMPLS protocol with software-defined networking (SDN) for optical multicasting.

Key Research Projects

Real-time bandwidth estimation and rate adaptation for video calls [5]
In collaboration with WeChat
– Designed a bandwidth prediction scheme for video calls over cellular networks based on time-series forecasting.
– Built a frame discarding mechanism for temporal layered streams against inaccurate video rate control.
– Achieved %23 more bandwidth utilization and 2-sec & 300-msec reduction in the 95-percentile and the mean frame delays compared to Apple FaceTime.
– Design and insights reported to have been implemented in WeChat.

Maximizing perceptual video call quality in the presence of packet loss [3]
– Took a fresh approach to maximizing video call quality over unreliable links by blending popular error concealment methods with joint optimization of frame rate, quantization and error correction.
– Performed analysis for different video coding techniques and under different packet loss mechanisms.
– Designed solution algorithms, showing the efficiency of hierarchical-P coding against bursty packet losses.

Dealing with upload/download capacity heterogeneity in P2P video conferencing [4]
– Proved optimality of Mutualcast trees for fully-connected P2P networks with finite upload/download capacity.
– Leveraging this result, maximized the overall video quality in video conferencing systems that use layered and non-layered video, under heterogeneous peer capacities.
– Showed partitioned simulcasting outperforming layered video distribution, due to coding overhead of latter.

Adaptive coding and scheduling decisions for layered data delivery from multiple servers [6]
– Modeled layered data stream delivery from multiple servers over unreliable links as a Markov decision process.
– Proposed solution using Q-learning with virtual experience.
– Foresighted decisions in face of uncertainty minimize layered video buffering in P2P networks as application.

For other projects, see [1], [2], [7], [8], [9].

Key Graduate Courses

Stochastic Processes	Statistical Signal Processing	Digital Communications
Convex Optimization	Image Communications	Machine Learning (audited, Caltech)
Combinatorics & Graph Theory	Cloud Computing (audited, UIUC)	Intro to OSs (audited, Georgia Tech)

Courses Taught

Internet Architecture & Protocols (TA)
Communication Networks: Design & Algorithms (TA)
Data Structures & Algorithms (TA)
Information Theory and Coding (Student TA)

Skills

Programming: Fluent in C++, C, Matlab. Familiar with Python, Bash shell scripting.

Notable libraries:
– FFmpeg, x264 (modified to implement hierarchial-P coding), SDL 2, POSIX threads.
– Numpy, Scipy, Matplotlib.

Networking: Berkeley sockets, Wireshark, Mininet.

Video: H.264/AVC, H.264/SVC, VP9, webRTC.

Projects: github/eymenkurdoglu (all is opensource)

Interests

Drumming, Sci-Fi, Cooking, History, Comics, Games, Jogging.

Publications

[1] Fanyi Duanmu, Eymen Kurdoglu, S Amir Hosseini, Yong Liu, and Yao Wang. "Prioritized Buffer Control in Two-tier 360 Video Streaming". In: *Proceedings of the Workshop on Virtual Reality and Augmented Reality Network*. ACM. 2017, pp. 13–18.

[2] Fanyi Duanmu, Eymen Kurdoglu, Yong Liu, and Yao Wang. "View direction and bandwidth adaptive 360 degree video streaming using a two-tier system". In: *2017 IEEE International Symposium on Circuits and Systems (ISCAS)*. IEEE. 2017, pp. 1–4.

[3] Eymen Kurdoglu, Yong Liu, and Yao Wang. "Perceptual Quality Maximization for Video Calls with Packet Losses by Optimizing FEC, Frame Rate and Quantization". In: *IEEE Transactions on Multimedia* (2017).

[4] Eymen Kurdoglu, Yong Liu, and Yao Wang. "Dealing with user heterogeneity in P2P multi-party video conferencing: layered distribution versus partitioned simulcast". In: *IEEE Transactions on Multimedia* 18.1 (2016), pp. 90–101.

[5] Eymen Kurdoglu, Yong Liu, Yao Wang, Yongfang Shi, ChenChen Gu, and Jing Lyu. "Real-time bandwidth prediction and rate adaptation for video calls over cellular networks". In: *Proceedings of the 7th International Conference on Multimedia Systems*. ACM. 2016, p. 12.

[6] Nikolaos Thomos, Eymen Kurdoglu, Pascal Frossard, and Mihaela Van der Schaar. "Adaptive prioritized random linear coding and scheduling for layered data delivery from multiple servers". In: *IEEE Transactions on Multimedia* 17.6 (2015), pp. 893–906.

[7] Eymen Kurdoglu, Yong Liu, and Yao Wang. "Dealing with user heterogeneity in P2P multiparty video conferencing: Layered coding versus receiver partitioning". In: *2014 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS)*. IEEE. 2014, pp. 239–244.

[8] Eymen Kurdoglu, Nikolaos Thomos, and Pascal Frossard. "Scalable video dissemination with prioritized network coding". In: *2011 IEEE International Conference on Multimedia and Expo (ICME)*. IEEE. 2011, pp. 1–6.

[9] Nikolaos Thomos, Hyunggon Park, Eymen Kurdoglu, and Pascal Frossard. "NC node selection game in collaborative streaming systems". In: *2010 IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP)*. IEEE. 2010, pp. 5570–5573.