Konstantinos Psychas

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EDUCATION	**Columbia University**, NY, USA	

- Ph.D. Candidate in Electrical Engineering — **Feb 2015 – May 2020**
  - Cumulative GPA: 3.71 / 4.00
- M.S. in Electrical Engineering — **Sep 2013 – Feb 2015**
  - Cumulative GPA: 3.83 / 4.00

National Technical University of Athens, Athens, Greece

- Ptychion (5 years of studies) in Electrical and Computer Engineering — **Sep 2006 – Dec 2011**
  - Graduated 9th out of 330
  - Cumulative Grade: 9.26 / 10.00

AWARDS & SCHOLARSHIPS

- Edwin Howard Armstrong Fellowship – Columbia University — **2013 – 2017**
- Second Prize in International Mathematical Competition (IMC) — **2009**
- Bronze Medal in International Mathematical Olympiad (IMO) — **2006**

RESEARCH PROJECTS

Theory for Auto-scaling for Resource Reservation in Cloud Services   **Spring 2018 – Spring 2020**

- Derived algorithm that achieves the following, without any estimate of future demand of services
  - allocates resources such that higher priority services have higher availability,
  - maximizes profit of cloud operator when all resources are in use,
  - minimizes resource usage when demand is low.
- Proved performance limits and convergence properties of the algorithm using Lyapunov analysis, stochastic processes and linear optimization models.
- Developed Python library that simulates the algorithm including arrival and departure processes and visualizes performance metrics; verified that simulation results are consistent with the analysis.

Scheduling Jobs with Random Resource Requirements   **Fall 2017 – Spring 2019**

- Designed scheduling algorithms for jobs with random resource requirements. The algorithms are oblivious to the distribution of the requirements.
- Characterized the theoretical maximum throughput any algorithm can achieve and designed algorithms that can provably achieve $2/3$ of this maximum.

Randomized Algorithms for Scheduling Multi-Resource Jobs   Summer 2018 – Fall 2018

- Recommended and implemented variants of the a low complexity distributed randomized scheduling algorithm that achieves maximum throughput.
- Concluded through simulations that average delay of queued jobs can be improved even with modifications that add minor additional complexity to the original algorithm.

Non Preemptive VM scheduling   **Summer 2016 – Summer 2017**

- Designed non-preemptive VM scheduling algorithm based on approximate solutions to Knapsack. The scheduling algorithm can be tuned to provide a tradeoff between delay, complexity and throughput.
- Simulated algorithm with synthetic and real traffic traces in comparison with literature algorithms
- Verified algorithm's delay remains bounded even in scenarios in which other literature methods are not or yield much higher average delays.

Project on Simulation of Fruit Fly Brain: Neurokernel   **Spring 2014 – Fall 2015**

- Developed web visualization app of fruit fly brain neurons, consisting of dynamic 3D and 2D views; optimized 3D model to make app responsive even for thousands of neurons. *Javascript* [D3js, Threejs], *Python* [Flask]
- Built simulation of fly brain vision; added customization through configuration files; automated projection of video patterns on fly's eye; calibrated different eye models; visualized neuron output. Contributions added to the open source projects of retina and the joint model of retina-lamina. *Python* [Matplotlib, PyCUDA]

COURSE PROJECTS	**Performance Analysis of Randomized Scheduling Algorithms**	**Spring 2016**

COURSE PROJECTS

Performance Analysis of Randomized Scheduling Algorithms   **Spring 2016**
- Compared alternative randomized scheduling schemes of jobs to servers. Proved throughput optimality of variants but none outperformed all the others in experimental validation.   *Python*

Capstone Data Science Project on Internet Marketing   **Spring 2016**
- Collaborated with MediaMath company to predict user response to ad exposure; designed predictive features and built classification models with Spark; achieved prediction accuracy comparable with MediaMath models; parts of modeling were adopted by company.   *Scala* [Spark], *AWS* [S3]

Basic Functionality Shell   **Fall 2015**
- Implemented basic shell that supports among others addition and removal of directories from PATH and listing or execution of commands from history; debugged implementation to avoid memory leaks; followed strict formatting rules and successfully passed all tests.   *C* [Valgrind]

Convex Optimization Project: Comparison of Uniform and Non Uniform Sampling   **Fall 2014**
- Formulated problem of choosing sampling times and sampled values of a signal as a convex optimization problem; solved the problem with alternate optimization; compared the result with the uniform sampling approach.   *MATLAB*

Computational Genomics project: GPU Implementation of a Sequence Alignment Algorithm   Fall 2014
- Translated implementation of chain filtering step of BWA from C to CUDA; Measured relative performance of implementation. Found improvement in performance when number of chains exceeds 300.   *C, CUDA*

Simulation of Ant's Locomotion   **Fall 2013**
- Implemented neuromechanical model that simulated ant's movement. With appropriate feedback to neurons ant could successfully move along a line or follow a square path.   *MATLAB*

Internet Communication Application: Jitsi (former SIP Communicator)   **Spring 2010**
- Added new functionality to existing server and client versions of application; updated GUI of application; implemented blocking of incoming calls; kept communication compatible with SIP protocol.   *Java*

PERSONAL PROJECTS

word_etymologist   **Spring 2020**
- Designed Keras model that can classify words based on their origin (e.g. Latin, Greek, French). Model can be trained on small dataset or interactively through command line or a GUI.

customizable_simulator   **Fall 2019**
- Generic simulation classes for automation of simulation experiments in Python.

youtube_playlist_app   **Summer 2019**
- Go Application that saves information of the Youtube playlists of a user in a text file.

regexp   **Spring 2017**
- Regular Expression Parser in Java.

brain2neo   **Spring 2016**
- Python tool for conversion of an application's XML documents to Neo4j graphs.

logging_recipe   **Spring 2016**
- Logging recipe in Python that combines user and library configuration.

SELECTED PUBLICATIONS
- K. Psychas, J. Ghaderi. "A Theory of Auto-Scaling for Resource Reservation in Heterogeneous Cloud Services," Submitted, Arxiv version.
- K. Psychas, J. Ghaderi. "Scheduling Jobs with Random Resource Requirements in Computing Clusters," IEEE INFOCOM **2019**, Accepted.
- K. Psychas, J. Ghaderi. "On Non-Preemptive VM Scheduling in the Cloud," in Proc. ACM Meas. Anal. Comput. Syst. 1, 2, Article 35, 29 pages **Dec 2017**.
- A. A. Lazar, K. Psychas, N. H. Ukani, Y. Zhou, "A Parallel Processing Model of the Drosophila Retina," *Neurokernel Request for Comments, Neurokernel RFC #3* , **Aug 2015**.
- K. Konstanteli, T. Cucinotta, K. Psychas, T. Varvarigou, "Admission Control for Elastic Cloud Services," in *Cloud Computing (CLOUD), 2012 IEEE 5th International Conference on* , pp.41-48, **Jun 2012**.

OTHER COLUMBIA PUBLICATIONS
- K. Psychas, J. Ghaderi, Randomized Algorithms for Scheduling Multi-Resource Jobs in the Cloud , IEEE/ACM Transactions on Networking, vol. 26, no. 5, **Oct 2018**.
- K. Psychas, and J. Ghaderi, On Non-Preemptive VM Scheduling in the Cloud, *ACM SIGMETRICS* **Jun 2018**.

- Y. Zhou, K. Psychas, N. H. Ukani, and A. A. Lazar Visualizing Parallel Information Processing in the Fruit Fly Retina *Computational and Systems Neuroscience Meeting* , **Feb 2016** , Salt Lake City, UT.
- A. A. Lazar, K. Psychas, N. H. Ukani, and Y. Zhou Retina of the Fruit Fly Eyes: A Detailed Simulation Model *BMC Neuroscience* , Volume 16 (Suppl 1) , pp. 301 , **Jul 2015**.
- L. E. Givon, A. A. Lazar, K. Psychas, N. H. Ukani, C.-H. Yeh, and Y. Zhou Neurokernel: Building an in Silico Fruit Fly Brain *IEEE EMBS BRAIN Grand Challenges Conference* , IEEE , **Nov 2014**.

TEACHING EXPERIENCE

Columbia University, New York, USA
- Teaching Assistant: Data Stream Processing (Spring 2017) Intro to Computational Neuroscience (Fall 2016, Fall 2015, Fall 2014), Deep learning (Spring 2016), Random Signals & Noise (Spring 2015)
  - Graded programming and written assignments, helped students in person or through course discussion forums, took part in design of course assignments and of solutions.

National Technical University of Athens, Athens, Greece
- Teaching Assistant: Algorithms and Complexity (Fall 2010), Introduction to Programming (Fall 2007)
  - Helped students in programming lab, participated in design of programming assignments.

WORK EXPERIENCE

National Technical University of Athens, Athens, Greece
- EXPERIMEDIA Project Research Assistant   **Jan 2012 – Jul 2013**
  - Refactored math model of job admission in the cloud improving its execution time.
  - Contributed to Java library that reads and posts comments to different social media
  - Performed administrative tasks to server that hosted web application for one of the project's experiment.

SKILLS

PROGRAMMING LANGUAGES

Prior Experience: R, Javascript, Java, MATLAB, C, Go   *Proficient*: Python
OTHER TOOLS

LaTeX, Bash, Vim, Git, Mercurial, Microsoft Excel scripting, AWS, Docker, Kubernetes

STANDARDIZED TESTS
- GRE computer science subject test: 840 (92%)   **Nov 2011**

SELECTED COURSEWORK
- Graduate Level: Operating Systems, Machine Learning, Network Algorithms and Dynamics, Advanced Digital Signal Processing, Convex Optimization, Information Theory, Analysis and Probability, Computer Communication Networks, Internet-Economics Engineering and Implications for Society, Topics in Datacenter Networks
- Undergraduate Level: Algorithms & Complexity, Software Engineering, Cryptography, Programming Languages, Databases, Internet Programming, Computer Architecture, Stochastic Systems and Communications, Graph Theory, Computer Graphics