

# Ilija Ilievski

Deep Learning, Graduate School for Integrative Sciences and Engineering, National University of Singapore  
ilija139@gmail.com • ilija.ilievski@u.nus.edu • ilija139.github.io

## ABOUT

Ilija is a machine learning researcher building holistic models of unstructured data from multiple modalities. His diverse, seven-year experience as a machine learning researcher includes projects on combining satellite images and census data for complex city models, utilizing movie metadata and watch statistics for recommender systems, and fusing image and text data representations for visual question answering. Currently, Ilija is working on developing an interpretable deep learning model of financial data coming from multiple sources.



## RESEARCH EXPERIENCE

**Time Series Forecasting with Deep Learning** Sep. 2017 – Present  
Using deep learning we discover the predictive power of one financial time series, such as liquidity, in forecasting another financial time series, such as volatility, [1].  
Supervisor: A-Prof. Ying Chen, Dep. of Statistics & Applied Probability, NUS

**Image Question Answering** Nov. 2015 – Present  
A unified deep learning model of image and text data applied to VQA, [2,3,4,9].  
Supervisor: Dr. Jiashi Feng, Dep. of Electrical and Computer Engineering, NUS

**Non-Convex Global Optimization in High Dimensions** Nov. 2015 – Present  
An algorithm for non-convex global optimization in up to 20 dimensions, [5].  
Supervisors: Prof. Christine A. Shoemaker and Dr. Jiashi Feng, ISE & ECE, NUS

**Hyperparameter optimization of Deep Learning Algorithms** Nov. 2015 – Sep. 2016  
Methods for efficient hyperparameter optimization of deep learning algorithms, [6,8].  
Supervisor: Dr. Jiashi Feng, Dep. of Electrical and Computer Engineering, NUS

**Discourse Relation Extraction** Nov. 2014 – Nov. 2015  
Discovering structure and extracting relations in news articles, [7].  
Supervisors: Prof. Min-Yen Kan and Prof. Hwee Tou Ng, School of Computing, NUS

**Metadata Information Extraction** Jun. 2013 – Sep. 2013  
Extracting movie metadata from text descriptions and user watch statistics, [11].  
Supervisor: Dr. Sujoy Roy, Institute for Infocomm Research, A\*STAR

**Modelling Users, Societies, & Environments** Nov. 2011 – Jun. 2013  
Machine learning GUI tool for modeling and simulation of urban development, [10,12,13].  
Supervisor: Prof. Sonja Gievska, Faculty of Computer Science and Engineering, UKIM

## EDUCATION

**Ph.D., Deep Learning**, National University of Singapore, Singapore  
Representation Learning of Data with Multiple Modalities Aug. 2014 – Nov. 2018 (*exp.*)  
Adviser: Dr. Jiashi Feng

**M.Eng., Software Engineering for Machine Learning**, UKIM, Macedonia  
Intelligent Tool for Modeling and Simulation of Urban Development Nov. 2011 – Mar. 2014  
Adviser: Prof. Sonja Gievska

**B.Sc., Computer Engineering**, Ss. Cyril and Methodius University, Macedonia  
Algorithm for Clustering News Articles Sep. 2006 – Mar. 2011  
Adviser: Prof. Andrea Kulakov

<b>WORK EXPERIENCE</b>	<p><b>Research Assistant</b>, Dep. of Statistics &amp; Applied Probability, NUS Sep. 2017 – Present Part-time research assistant working on forecasting financial time series with deep learning.</p> <p><b>Teaching Assistant</b>, National University of Singapore 2015 – 2016 Modules: [CS3226] Web Programming and Applications [CS1101] Programming Methodology</p> <p><b>Research Assistant</b>, Institute for Infocomm Research, A*STAR, Singapore 2013 Extracting movie metadata from text descriptions and user watch statistics.</p> <p><b>Software Engineer</b>, Upwork 2010 – 2014 Design and development of full-stack software systems for web and mobile.</p> <p><b>Math Tutor</b> 2008 – 2012 Preparing high school students for mathematics competitions.</p>
<b>AWARDS &amp; ACHIEVEMENTS</b>	<p><b>Visual Question Answering Challenge</b>, IEEE CVPR 2017 Jul. 2017 <b>First</b> place for single participants, <b>third</b> overall, in competition about developing machine learning algorithms for answering human-posed questions about images.</p> <p><b>NGS Scholarship</b>, National University of Singapore 2014 – 2018 The NGS Scholarship is awarded to talented students with an aptitude for innovative, high calibre Ph.D. research. Awarded to the top 1% of the graduate research students at NUS.</p> <p><b>Third Place in News Recommender Systems Challenge</b>, ACM RecSys Oct. 2013 Developing fast and scalable web news recommender system for ACM RecSys challenge.</p> <p><b>SIPGA Award</b>, A*STAR, Singapore Jun. 2013 The Singapore International Pre-Graduate award supports research attachments for top international students to experience the vibrant scientific environment in A*STAR Research Institutes.</p> <p><b>Algorithm Competition Finalist</b>, CodeFu 2009 – 2014 Secured a position in the nationwide final competition each year from 2009 to 2014.</p>
<b>SKILLS</b>	<p>Excellent programming skills in Python, Java, and JavaScript, working knowledge in C/C++. Everyday use of <b>numpy</b>, <b>pandas</b>, <b>scipy</b>, and <b>matplotlib</b> python libraries, and expert knowledge and contributor to <b>PyTorch</b> and <b>Torch</b> deep learning frameworks. Strong analytical and problem solving skills, excellent communication skills and collaborative work ethic.</p>
<b>INVITED TALKS</b>	<p><b>The Institute of Statistical Mathematics</b>, Tokyo, Japan 09 Mar. 2018 “Interpretable forecasting of financial time series with deep learning”</p> <p><b>Neural Information Processing Systems, NIPS</b>, Long Beach, CA, USA 05 Dec. 2017 “Multimodal Learning and Reasoning for Visual Question Answering” (poster presentation)</p> <p><b>ACM Multimedia Understanding</b>, Mountain View, CA, USA 27 Oct. 2017 “Generative Attention Model with Adversarial Self-learning for VQA”</p> <p><b>NVIDIA AI Conference</b>, Singapore 23 Oct. 2017 “Efficient Hyperparameter Optimization of Deep Learning Algorithms”</p>

- QuantCon** - Algorithmic Trading and Quantitative Finance Conf., Singapore 29 Sep. 2017  
 “Deep Reinforcement Learning for Optimal Order Placement in a Limit Order Book”
- IEEE CVPR 2017 VQA Challenge Workshop**, Honolulu, HI, USA 26 Jul. 2017  
 “A Simple Loss Function for Improving the Convergence and Accuracy of VQA Models”
- RE•WORK: Deep Learning in Finance Summit Asia**, Singapore 27 Apr. 2017  
 “Deep Reinforcement Learning for Optimal Order Placement in a Limit Order Book”
- AAAI Conference on Artificial Intelligence**, San Francisco, CA, USA 07 Feb. 2017  
 “Efficient Hyperparameter Optimization of Deep Learning Algorithms”
- RE•WORK: Deep Learning Summit Asia**, Singapore 20 Oct. 2016  
 “Reasoning with Deep Learning: the Visual Question Answering Problem”
- NVIDIA GTCx**, Melbourne, Australia 04 Oct. 2016  
 “Deep Learning Solutions for Visual World Understanding”

- PUBLICATIONS**
- [1] Ilievski I., Feng J. and Chen Y., “**Detecting Driving Factors of Financial Assets with Interpretable Deep Learning**”, Manuscript under review, 2018.
  - [2] Ilievski I. and Feng J., “**Multimodal Learning and Reasoning for Visual Question Answering**”, *Neural Information Processing Systems (NIPS)*, Dec. 2017.
  - [3] Ilievski I. and Feng J., “**Generative Attention Model with Adversarial Self-learning for Visual Question Answering**”, *Association for Computing Machinery (ACM) Multimedia Understanding*, Oct. 2017.
  - [4] Ilievski I. and Feng J., “**A Simple Loss Function for Improving the Convergence and Accuracy of Visual Question Answering Models**”, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR), VQA workshop*, Jul. 2017.
  - [5] Ilievski I., Akhtar T., Feng J. and Shoemaker C., “**Efficient Hyperparameter Optimization of Deep Learning Algorithms Using Deterministic RBF Surrogates**”, *Association for the Advancement of A.I. (AAAI)*, Feb. 2017.
  - [6] Fu J., Ng R., Liu Y., Chen D., Ilievski I., Pal C., and Chua T., “**Neural Optimizers with Hypergradients for Tuning Parameter-Wise Learning Rates**”, *International Conference on Machine Learning (ICML), AutoML workshop*, Aug. 2017.
  - [7] Lei W., Wang X., Liu M., Ilievski I., and Kan M., “**SWIM: A Simple Word Interaction Model for Implicit Discourse Relation Recognition**”, *International Joint Conference on Artificial Intelligence (IJCAI)*, Aug. 2017.
  - [8] Ilievski I. and Feng J., “**Hyperparameter Transfer Learning through Surrogate Alignment for Efficient Deep Neural Network Training**”, *Pre-print arXiv:1608.00218*, Aug. 2016.
  - [9] Ilievski I., Yan S. and Feng J., “**A Focused Dynamic Attention Model for Visual Question Answering**”, *Pre-print arXiv:1604.01485*, 2016.
  - [10] Ilievski I., “**Tool for Modelling and Simulation of Urban Development**”, *Master’s Thesis, Ss. Cyril and Methodius University*, Mar. 2014.
  - [11] Ilievski I., and Roy S. “**Personalized News Recommendation Based on Implicit Feedback**”, *Association for Computing Machinery (ACM) Recommender Systems Conference*, Oct. 2013.
  - [12] Gievska S., Marina O. and Ilievski I., “**Discovering Patterns of Urban Development in Skopje**”, *9<sup>th</sup> Congress Virtual City and Territory*, Oct. 2013.
  - [13] Ilievski I., Gievska S. and Marina O. “**Discovering Patterns of Urban Development**”, *ICT Innovations*, Aug. 2013.