National Research University
Higher School of Economics - Nizhny Novgorod (HSE-NN)

Laboratory of Algorithms and Technologies for Network Analysis (LATNA)

– Academic supervisor: P. Pardalos, distinguished professor, University of Florida.
  Research interests: optimization, data analysis

– Laboratory head: Prof. V. Kalyagin.
  Research interests: applied mathematics, decision making

– Point of contact: Prof. A. Savchenko. Head of research group in analysis of multimedia data (AMD).
  Research interests: CV, voice, statistical pattern recognition

Faculty of Informatics, Mathematics and Computer Science
– Deputy dean: N. Karpov.
  Research interests: NLP, speech processing
List of research projects & resource capabilities

• Research topics and projects in our lab:
  – Optimization of image recognition algorithms for real-time applications:
    • face identification in low-resource setting
    • image categorization for small training samples
    • emotion recognition
    • voice analysis
  – Clustering and Search Techniques in Large Scale Networks:
    • market networks, biological networks, social networks
  – Discrete optimization and applications in retail

• Resources:
  – Equipment: LATNA computational cluster
  – HR:
    • 20 full-time CS researchers
    • common PhD school with HSE-Moscow: 5 PhD students in LATNA
    • 5 MS students at LATNA, 3 MS engineers and 4 BS students at AMD group
  – Students potential:
    • 50 MS students: 25 students of each year, Data mining programme
    • 200 BS students: 25 students of each year, ‘Applied mathematics” and “Business informatics” programmes
Core competency in AI

• Contests:
  – Group-level emotion recognition (EmotiW 2017)
  – Sentiment analysis in Twitter (SemEval 2016, 2017)
  – Data Science Game 2017

• Technical experience:
  – Deep learning frameworks: Caffe, Tensorflow/Keras
  – 5-10 year experience in industry (embedded systems, OSS, DBMS, CV, NLP, etc.)

• Cooperation with industry:
  – CV – Intel (NN branch), IntelliVision
  – Data Analysis – Seldon, Magnit, KPMG (NN)
  – Voice – IstraSoft, Roskomnadzor
  – Recommender systems: Neuron (NN), Ntd.tv (New York)


• More than 50 publications about optimization of recognition algorithms in low-resource settings:
  – approximate nearest neighbor search
  – highly-optimized deep CNNs
  – sequential analysis of deep features
Cooperation Model

Both options are possible:

• Joint International R&D Lab (preferred):

  – **Concept:** from research to production! Integration with Samsung products is fast: former HARMAN center is located in NN
  – **Cost:** at the level of International laboratories of HSE
  – **Human Resources:**
    - Expected structure: 4 senior researchers, 1 senior developer, 5-10 researchers, 10-20 junior researchers and interns
    - Existing AI staff: 3 senior researchers, 5 researchers, 10 junior researchers
    - Extendable community (special academic prizes for research results in HSE):
      - attraction of HSE Moscow, UNN, NNSTU and RAS institutes
      - 100/25 BS/MS graduate annually
  – **Intellectual property rights.** Publications with HSE and Samsung affiliations are highly preferred. Samsung retains patents for particular solutions

• **R&D projects.** Team of 5-10 experts focused on topics:
  - optimization of image recognition algorithms
  - practical vision, voice, NLP applications in low-resource settings
  - massive network analysis
Possible cooperation areas

• Possible cooperation areas related Samsung’s interest – AI modules for embedded systems based on Common Framework (Tensorflow, Caffe):
  – Offline CV
    • Optimization of offline image recognition algorithms for embedded devices in low resource settings
    • fast video analysis/identification
    • accurate image recognition for small training samples
  – Offline analysis of data from wearable sensors for personal assistant
    • Personal monitoring in healthcare using voice, heart rate, etc
  – Data intelligence for networks of embedded devices (IoT, etc.)
    • Pre-processing, network structures analysis and optimization
    • Time series sensor data analysis and prediction

• Action item next meeting with Top manager level:
  – Tasks for the joint projects & KPI
  – Choice of cooperation model
  – Long-term co-work plan: from small AI group to large international lab
  – Short-term co-work schedule