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B Ravi Kiran

R&D Engineer, AI-ML for Navya

Overview

- **Industry**
  - **Machine learning, Technical Lead** Navya, Paris
  - **AI & ML R&D Engineer** Autonomous systems team,AKKA Technologies, Guyancourt.
  - **Vision & Deep learning Consultant** at Uncanny vision, Paris(remote).
  - **Software design engineer** Experience in ARM/DSP embedded environment, Texas Instruments, India.
  - **Strong programming skills** in C++, Python, C, Matlab.
- **Academic**
  - **ATER** (Temporary professor) Université Lille 3 and CRIStAL lab, INRIA-Lille Nord.
  - **PostDoc II** ENS Paris & ThalesAlenia Space, Time series anomaly detection.
  - **PostDoc I** CAOR, Mines ParisTech, Hyperspectral image classification for tumor detection.
  - **PhD** Computer Science, Universite Paris-Est (LIGM-ESIEE). **Best thesis** in Mathematics & STIC
  - **20 publications** in vision & ML, some in leading confs/journals such as ECCV, Pattern recognition.
- **Focus** Perception (Vision/Lidar), ML, Deep learning, Deep reinforcement learning.

Skills

Programming	Python, C++, C, Matlab, Git, Latex/Beamer.
Packages	Pandas, Scikit-learn, Scikit-image, OpenCV, Tensorflow, Keras, RTMaps
Strengths	Image analysis, mathematical morphology, signal processing, graph theory, machine learning, deep learning.
Languages	English(Professional), French(Fluent, TCF-ANF Certified), Tamil(Maternal), Kannada, Hindi(Fluent).
Domains	Video representation learning, time series analysis, hyperspectral imaging, Graph cuts, image segmentation.
Reviewer	CIARP 2012, ISMM 2013/15, PR Letters 2013/15/16, ICIP 2014, ITSC 2016, MSSP 2017, ICVES 2017, IROS 2017, TIP 2017, NIPS2017 LLD,ITSC 2018, PR 2018/19, ALA 2018, ITSC 2019
Teaching	Machine learning, Dimensionality reduction course, Image processing course

Experience

Nov 2018 – Now **AI-ML Technical Lead, NavyaTech**, *Paris area, France*, Project.
- Deploying deep learning modules for Vision/Lidar
- Evaluating the effect of pointcloud density on road extraction
- Co-Supervised Masters student on Realtime Multi-task learning for autonomous driving
- Deep Reinforcement learning for Real-world Autonomous Driving Tasks

Jan 2018 – Oct 2018 **AI-ML R&D Engineer, AKKA Technologies**, *Paris area, France*, Project.
- Co-defined/prototyped clustering-obstacle detection pipeline and tracking with Lidar.
- Overseeing integration of S/W components for autonomonous driving project.
- Co-Reviewed deep Reinforcement learning for Autonomous Driving Tasks.
- Reviewed End-to-End DNN architectures for autonomous driving.
- Co-Guiding PhDs and Master internships while aiming to perform industrial research.

May 2017 – Nov 2017 **Consultant (Remote) at Uncanny Vision**, *Paris, France*, Project.
- **Problem** : Video representation learning for unsupervised anomaly detection in video surveillance context.
- **Models** : Variational Autoencoders, Generative Adversarial Networks, Convolutional LSTM
- **Collaboration** : Ranjith Parakkal, Dilip Thomas

Oct 2016 – Aug 2017 **Teaching assistant & Researcher(ATER), Université Lille 3**, *Lille, France*.
- **Teaching** (192H) : (License/Master) Data mining, Machine learning, Dimensionality reduction.
- **Lab** : Data intelligence Lab, CRIStAL, Lille **Focus** : Time series analysis and sequential learning.
- **RF pruning** : Evaluated performance of pruned random forests using their out-of-bag samples. [git] [Project]

Dec 2015 – Nov 2016 **Post-doc Data lab, ENS Paris and ThalesAlenia Space**, *Paris, France*.
- **Problem** : Time series anomaly detection.
- **Streaming Multiscale Anomaly detection** [Project]: Track correlations across multiple scales of a moving window over time series with varying pseudo-periodicities. A streaming PCA algorithm to decorrelate the reconstruction errors across scales to detect anomalies. [**Datasets** Yahoo! and Numenta]
- **Predictive models for anomaly detection(AD)** : **Data** : Telemetry data from ThalesAlenia Space.
  - Auto-regressive models on principal components using scattering transform, Non-linear moving window features.
  - Other tasks : data cleaning, visualization, validating results with domain experts.
- **Deep learning reading group** reviewed state-of-the-art in CNN, RNN architectures & generative models.
- **Deliverables** : Predictive models, Streaming AD, Scattering transform, Local Outlier Factor, final report.

Nov 2014 – Nov 2015 **Post-doc Centre de Robotique(CAOR) & HELICoiD, Mines ParisTech**, *Paris, France*.
- **Project** : Real-time classification of hyper-spectral images(HSI) for surgical inter-operative aid and Tumor detection.
- **Advisors** : Bogdan Stanciulescu, Jesus Angulo
- **Description** : The goal of HELICoiD project is to localize cancerous tissues using high spatial-spectral resolution HSI of the brain in-vivo, for better tumor resection margins. Hierarchical NMF was used as an exploratory tool to extract the best rank-1 approximation of the input HSI pixel subsets.
- **Deliverables** : Unsupervised clustering by H2NMF, Random Forest cluster classifier pipeline, Data processing : spatio-spectral repeatability error estimation, camera calibration, specularity removal. Final project report.
- Worked across multi-disciplinary team of neurosurgeons imaging, algorithms & architecture experts.

Oct 2011 - Oct 2014 **PhD at A3SI-LIGM UMR 8049, ESIEE**, *Paris,France*.
- **Title** : *Energetic-Lattice based optimization* [Thesis] [Slides] **Director** J. Serra **Co-encadrant** J. Cousty
- **Teaching** (100H) : TD, TP and Masters Courses in Mathematical Morphology & Graph Theory.
- **Contributions** : Generalized Breiman's Dynamic program (DP) for image image segmentation by characterizing energies and partition families that can be optimized by the dynamic program. Evaluation on Berkeley's dataset and geo-spatial population data from PACA.
- **Adapting hierarchy with multi-label graph cuts** : Adapting hierarchy of segmentations with hierarchical costs (parent-child relationship) using multi-label graph cuts.

Apr – Jun 2011 **Internship at A3SI-LIGM, ESIEE**, *Paris, France*.
Tutorial on Morphological operators in PINK, a library for image processing operators and non-linear filtering.

Mar 2010 – Feb 2011 **Research Assistant, Computer Vision and AI Lab, IISc**, *Bangalore, India*.
- **Project** : Segmentation algorithms for roads/lanes for autonomous cars. **Advisor** : K. R. Ramakrishnan
- **Industrial project**: Compressed domain H.264 motion detection for video surveillance.
- **Mentored** : 3 bachelors and 1 masters project on the two problems.

Aug 2008 – Feb 2010 **Software Design Engineer, Texas Instruments**, *Bangalore, India*.
Embedded systems and programming on ARM and DSP.

Education

2011–2014 **PhD in Computer Science, Université Paris-Est Marne-la-Vallée**, *Paris, France*.
Best thesis award from Université Paris-Est 2015 in Mathematics et STIC

2004–2008 **B.E. Electronics & Communication, Visvesvaraya Technological University**, *Bangalore, India*.
- Grade: 3.8/5, Passed with distinction, Best outgoing student.
- Thesis: Crosstalk Elimination in ADSL systems by wavelet packet techniques.

Publications

Journals

1. Deep Reinforcement Learning for Autonomous Driving: Overview, Challenges and Roadmap [In Redaction] 2019
2. Overview of deep learning based methods for unsupervised and semi-supervised anomaly detection in videos, B Ravi Kiran, Dilip Thomas, Ranjith Parakkal, Journal Imaging MDPI Jan 2018, [pdf].
3. Spatio-spectral classification of hyperspectral images for brain cancer detection, PLOS one [pdf] March 2018
4. Intra-operative Visualization Using HSI for Brain Tumor Delineation, H. Fabelo, et al. [pdf], Sensors, MDPI, Jan 2018.
5. Global-local optimizations by hierarchical cuts, B Ravi Kiran, J. Serra , Pattern Recognition, Jan 2014 [Link]
6. Fusion of ground truths & hierarchies, B Ravi Kiran, J. Serra, Pattern Recognition Letters, Oct 2014 [Link]

Conferences

1. Exploring applications of deep reinforcement learning for real-world autonomous driving systems, VISAPP 2019, Victor Talpaert, Ibrahim Sobh, B Ravi Kiran, Patrick Mannion, Senthil Yogamani, Ahmad El-Sallab, Patrick Perez [pdf]
2. Prior 3D-Maps and Real-time Obstacle Detection for Autonomous Driving: A Review, B Ravi Kiran, et al. ECCVW 2018-AutoNUE workshop [pdf]
3. Streaming multi-scale anomaly detection for univariate time series, B Ravi Kiran, CAp 2017 [pdf, slides, poster]

4. Cost-complexity pruning of Random Forests, ISMM 2017, B Ravi Kiran, J. Serra.
5. Spatio-Spectral Classification of HSI [1] by Supervised & Unsupervised Methods. DCIS 2016, S. Ortega, et al. (3rd author)
6. Brain Cancer Detection based on Spatial-Spectral HSI Classification, DCIS 2016 Fabelo H., et al. (4th author)
7. Digitization of partitions & tessellations, Jean Serra & B Ravi Kiran, DGCI 2016 [pdf]
8. Clustering of HSI of brain tissues by hierarchical NMF, B R Kiran, B. Stanciulescu, J. Angulo, BIOIMAGING 2016,[pdf]
9. Braids of partitions, B Ravi Kiran, J. Serra, ISMM 2015 [pdf].
10. Constrained optimization on hierarchies of partitions, J. Serra, B Ravi Kiran, ISMM 2015, [pdf]
11. Energetic lattice for optimizing over hierarchies of partitions: J. Serra, B Ravi Kiran, ICIP 2014 [link]
12. Scale Space Operators on hierarchies of segmentations, B Ravi Kiran, Jean Serra, SSVM 2013, [pdf] [Poster]
13. Ground truth energies for hierarchies of segmentations, B. Ravi Kiran, Jean Serra, ISMM 2013. [pdf] [Poster]
14. Optima on hierarchies of partitions, J. Serra and B. Ravi Kiran, ISMM 2013. [pdf]
15. Global constraints on hierarchical segmentation, B Ravi Kiran, J. Serra, J. Cousty, ECCV 2012, HiPOT WK. [pdf]
16. Hierarchies & climbing energies, J. Serra, B Ravi Kiran ,J. Cousty, CIARP 2012 [pdf]
17. Summarizing Cricket Videos, Y S Kumar, S K. Gupta, **B R Kiran**, K R Ramakrishnan, C. Bhattacharyya, ISCE 2011 [Link]
18. Parallelizing connectivity Operators for Multicore Envs, Anoop K. P., **B R Kiran** & Y. Senthil Kumar, ICCSP 2011. [Link]
19. Connected Component Labeling by Recursion, B Ravi Kiran, Y S Kumar, Anoop K P, K R Ramakrishnan, NCC 2011 [Link]

Invited Talks

- Exploring applications of Deep RL for real-world autonomous driving systems [Slides], Cognitive Vehicles 2019 Berlin,
- Streaming multi-scale anomaly detection on time series, [Slides], CRISTaL Lille UMR 9189 May 2017
- Hierarchical clustering of hyperspectral images for tumor detection [Slides], Icube Univ. Strasbourg Mar 2017
- Braids of partitions and applications : Indian Institute of Science, EE Department, Aug 2016
- Constrained Optimization on Hierarchies of partitions [slides] : Centre de Morphologie Mathematique, Jan 2015.
- Fusions of Ground Truths and of Hierarchies [slides] : Journée ISS France, Ecole des Mines de Paris, Feb 2014.
- Climbing energies and optimal cuts [Slides 1, Slides 2]: UPC, Barcelona, Image Processing Group, Jun 2013.
- Climbing energies and optimal cuts : CMM, Fontainebleau, March 2013.
- Ground truth energies for hierarchies of partitions : Journée ISS France, Mines ParisTech, Paris, Feb 2012.
- Optimization on hierarchies & GIS problems : Indian Institute of Science CVAI lab Bangalore, India, June 2012.

Tutorials, Posters, Reports

- Tutorial ICIP 2014, Paris, *Optimizations on Hierarchies*, B. Ravi Kiran, J. Serra, J. Cousty, & H. Talbot. [slides]
- Theory of Braids, Energetic Lattices & Constrained Optimization, J. Serra, B Ravi Kiran. [Part 1] [Part 2]
- End-member extraction in HS images for tumor detection Kiran B.R., Stanciulescu B., Angulo J. ROMOPTO 2015 [poster]
- Real-Time Background Subtraction Using Adaptive Sampling & Cascade of Gaussians, B Ravi Kiran, Y Senthil Kumar [pdf]
- Climbing on Pyramids, J. Serra, Bangalore Ravi Kiran, Technical Report. 2012 [pdf]

References

- Industry : Senthil Yogamani, AI Architect for Autonomous Driving, Valeo, Galway, Ireland. [LinkedIn]
- Industry : Laurent Guigues, Principal research scientist, Amazon Seattle, United States. +1 408 647 0724, [LinkedIn]
- Post-doc Advisor : Jesus ANGULO, Senior scientist, Centre de Morphologie Mathematique, MINES ParisTech. + 33 1 64 69 47 75
- PhD advisor : J. SERRA, Professor Emiritus, Informatique, ESIEE Université Paris-Est. +33 (01) 6423 4820
- PhD reporter : Philippe SALEMBIER, Professor, Universitat Politecnica de Catalunya, Barcelona +(34) 9 3405 40 30

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[1] Hyperspectral Images