Computer Vision & Machine Learning
10 - 13 Dec 2014

INTERNATIONAL WORKSHOP REPORT

Prasanthi Nilayam Campus

Department of **Mathematics & Computer Science**

The Department of Mathematics and Computer Science (DMACS), Prashanti Nilayam Campus organized a four day workshop, "International Workshop on Computer Vision and Machine Learning - IWCVML-2014" from 10 - 13 December 2014. Several experts graced the event to make it a successful learning forum.

The primary objective of this event was to give sound exposure on emerging trends and current research challenges to the young faculty, researchers, engineers from industry and postgraduate students by bringing together renowned experts in the field of Computer Vision (CV) and Machine Learning (ML), from both academia and industry.

The workshop did provided valuable insights into the current challenges and relevant application areas which promise fertile research opportunities.

DAY 1: 10 Dec 2014

A Full-day Tutorial on " Fundamental predictive tools used by data-mining practitioners" was conducted by Dr. M. C. Prakash, Machine learning scientist from Amazon, Bengaluru. Dr. M. C. Prakash is a PhD in computer science from Michigan State University. Earlier, he has worked for GE Global Research (Bangalore) Dow Agro sciences (Indianapolis) as machine learning specialist in the business analytics team. He specializes in demand forecasting, rebate analytics, customer value modeling and other CRM related analytics.

The speaker explained two fundamental predictive tools used by data mining practitioners, namely linear regression and classification. Firstly, he talked about challenges with big data, types of data attributes, correlation and relationship between the attributes, followed by the basic descriptive statistics, plots that are used to understand and explore the data. In the following lab session, a demo on applying these models on real world data using python scikit package was done.

DAY 2: 11 Dec 2014

A Full-day Tutorial on " Subspace Clustering " was conducted by Dr S. Balasubramanian, faculty from department of mathematics and computer science, Sri Sathya Sai Institute of Higher Learning(SSSIHL). Dr S. Balasubramanian completed his PhD in Computer science in 2008 from SSSIHL. Currently he is serving as assistant professor in DMACS,

PSN campus. His research interests include computer vision and machine learning.

In this tutorial a couple of recent subspace segmentation algorithms viz Local subspace affinity and sparse subspace clustering were covered when data is sampled from a union of subspaces. As part of the tutorial, a lab session on implementation of Local subspace affinity algorithms with reference to motion segmentation was done in Matlab

DAY 3: 12 Dec 2014

Inaugural Session

The program commenced with the ceremonial lighting of lamp by the Honorable Chief Guest, Prof. K.B.R. Varma, vice-chancellor of our university.

Prof. V. Chandrasekaran, Head of Department of Mathematics and Computer Science (DMACS), SSSIHL then delivered the welcome address highlighting the importance and the need for the kind of unique workshops conducted by Sri Sathya Sai Institutions for helping the budding scientific community in the country.

His talk was followed by the inaugural address by the Chief Guest, Prof. K.B.R. Varma. The honorable chief guest presented a lovely analogy from the ancient scriptures of our land where in Lord Ganesha created by Mother Parvathi stood for wisdom and not merely for knowledge. He subsequently could write Maha Bharata, the largest epic of the world, with the same speed of dictation by sage Vedayasa without stopping for a moment. Similarly the tremendous

analysis power that gets generated by Machine Learning Techniques through a computing machine should help to solve the outstanding problems of today's society. Prof. K.B.R Varma then advised that all departments of the university should seek to harness the power of new findings of Machine Learning Techniques towards modeling and solving interdisciplinary problems such as those in health care domain.

Morning Session

The 1st session for the day was chaired by Prof. Chandrasekaran, Head, DMACS, SSSIHL.

The plenary speaker of this session was Prof. Jayanthi Sivaswamy, IIIT Hyderabad who spoke on "Segmenting a shallow structure from monocular images". The optic cup is a structure at the heart of the optic disk, a region where the nerve fibres leave the retina. Enlargement of the cup is a key indicator of glaucoma, a sight-threatening disease. Segmenting this cup from fundus images is a challenging problem due to several factors: the cup is defined primarily by a change in depth. It is shallow and the pupil allows only narrow-baseline imaging. The speaker presented two novel solutions to this problem. The first relies on multiview geometry while the second uses a coupled sparse dictionary learnt offline from paired optical coherence tomography (OCT) data and fundus images.

The next invited Talk was by Dr. Sharathchandra Pankanti, IBM T J Watson Research, Yorktown Heights, NY, USA who spoke on 'Video Big Data Systems: Applications and Assessments'. The speaker brought out the need for navigating, and searching a deluge of data from cameras and other sensors in a variety of applications including retail, public safety, transportation, healthcare, and education. The practical systems that are built, should be able to intelligently and efficiently analyze and extract salient and "interesting" information from an overwhelming amount of data. A variety of computer vision, machine learning and system optimization techniques were summarize by Dr. Panakanti that are used to successfully address different technical and business challenges.

The next invited Talk was by Dr. Vidit Jain, Senior Research Scientist, Yahoo Labs, Bangalore.
The topic of his talk was 'New frontiers in face detection'. The speaker presented the standard approaches used for

implementing different components of a face detector to identify the state-of-the-art performance on a challenging face data set, FDDB. Then he brought out the focus on a new research direction for face detection: rapid adaptation of detectors to new domains. In particular, the focus was on some of his recently published work (at CVPR and ICCV) that obliterates the need of a massive training set to build a detector from scratch, rather it rapidly and simply adapts an existing detector to a new domain.

Afternoon Session

The next talk was in the afternoon after lunch. Prof. G Srinivasaraghavan from IIIT Bangalore, gave a talk on Recent Advances in Clustering Theory. Clustering is an important data analysis primitive with widespread applications; often used as a preprocessing step prior to any serious inference or prediction from the data. Though there are several clustering algorithms with tremendous success in practice, ot much theoritical foundations were laid out for long time. Fortunately in the last decade and a half there have been significant theoretical developments in this area partly 'explaining' the success of the known algorithms. The learned speaker presented some important results and developments pertaining to error bounds, convergence, bounds on running time etc.

The next talk was by Dr. Uma Mudenagudi, BVB College of Engineering and Technology, Hubli. She gave a talk on Video Summarization. In this talk, a framework for video summarization using Gaussain Mixture Models (GMM) keeping the chronology of the activities intact for a specified time was presented. The motion information in a video is modeled as a 2D-Gaussian mixture model (GMM), to estimate the key motion frames in the video. The salient frames are detected depending upon the motion strength of the keyframe and user specified time. Then the motion information in a video is modeled as a 3D GMM, to estimate the key motion frames in the video. The proposed method finds applications in summarization of surveillance videos, movies, TV serials etc.

The final talk for the day was by Mr. Praveen Krishna Kumar who is currently working as a Lead Data Scientist in Google Inc. Mr. Praveens talk was on Computational Advertising. Computational Advertising is one of the trending and an emerging new scientific sub-discipline, which is an amalgamation of large-scale search and text analysis, information retrieval, statistical modeling, machine learning, classification, optimization, and microeconomics. The central problem, which this field attempts to address, is to find the "best match" between a given user in a given context and a suitable advertisement. In this talk, the speaker provided a case study of the how machine learning and statistical learning is used to solve this problem from an advertiser as well as a marketer's perspective.

DAY 4: 13 Dec 2014

Morning Session

The plenary speaker for the last day of the workshop was Prof. N. JeyaKumar, Bharathiar University, Coimbatore. The speaker made the presentation on Text Mining and Biomedical Tools. The speaker first presented text mining basic concepts, and its various applications. This was followed by a brief introduction and methodology and demo of newly developed text mining tools in biomedical domain at his research lab such as NAGGNER, ProNormz, PPInterFinder, HPIminer etc. available at http://www.biominingbu.org.The applications of text mining

The next talk was by Dr. Vineeth N. Balasubramanian, IIT Hyderabad. He spoke on Active Learning and its Application to Video Sequence Analysis.

The exponential growth of digital data and the corresponding scarcity in availability of label information for the data has increased the importance of active learning methods in machine learning. When faced with large amounts of unlabeled data, such algorithms automatically identify the exemplar and representative instances to be selected for manual annotation. Active learning techniques have gained popularity to reduce human effort in labeling data instances for inducing a classifier. The speaker gave an overview of active learning methods and described recent attempts towards a batch mode form of active learning, where a batch of data points is simultaneously selected from an unlabeled set.

The next speaker was Dr. Nanda Kambhatla, STSM, IBM Research - India (aka IRL). He made a presentation on Jeopardy! winning IBM Watson supercomputer from IBM that lies at the intersection of many fields - machine learning, predictive analytics, natural language processing etc. This heralds the dawn of an exciting new era in computing. In this talk the speaker gave a technical overview of Watson & then describe some recent technical advances leading to the first

commercial offering based on Watson technologies called the IBM Watson Engagement Advisor. He described efforts underway to extend and apply the technology to various domains for Financial Services, IT Support and for Education by making content or information more interactive and intelligent and enabling richer engagement by customers, system administrators or learners.

Afternoon Session

The afternoon session started with the talk by Dr. Sumohana Channappayya, IIT Hyderabad. The topic was Sparse Representations for Image Quality Assessment. A novel blind image quality assessment (BIQA) algorithm inspired by the sparse representation of natural images in the human visual system (HVS) was presented by the speaker. An over-complete dictionary is constructed from a set of pristine images using the K- SVD algorithm. This dictionary is then used to sparsely represent a different and significantly smaller set of pristine images to extract "reference" features. To evaluate the quality of a given image, features are extracted from its sparse representation and quantified with respect to the "reference" features. It is shown that the proposed algorithm consistently correlates well with subjective scores over several popular image databases.

The last speaker for the workshop was Mr. Suresh Marru whose presentation was on " Fostering computational science collaborations: Overview of Cyber infrastructure, Science Gateways, Scientific Workflows and Apache Airavata". Mr. Suresh Marru provided an overview of the NSF funded XSEDE project which provides access to high performance computing resources. He discussed the science gateways program and scientific workflow efforts, which attempt to broaden the scientific impact of XSEDE and accelerate scientific discovery by collaborating with science gateway developers to design, deploy and sustain advanced science-centric gateway interfaces and services. He further explained the Apache Airavata project, which provides science gateways with an abstraction layer for managing the execution and provenance of both single applications and workflows over many types of resources.

The valedictory talk was delivered by Prof. Chandrasekaran highlighting the achievements of DMACS in terms of research, teaching and facilities developed in the university for inter-disciplinary work. Vote of thanks was given by Dr. R. Raghunatha Sarma and the workshop concluded with a prayer to Bhagawan sri Sathya Sai Baba.

The organizing team of IWCVML-2015 offers their gratitude to the revered Founder Chancellor of SSSIHL, Bhagawan Sri Sathya Sai Baba for steering this workshop to successful completion with His Divine Blessings.

List of Speakers:

- Prof. Jayanthi Sivaswamy, IIIT Hyderabad
- Prof. G Srinivasa Raghavan, IIIT Bangalore
- Prof. N. Jeyakumar, Dept. of Bioinformatics, Bharathiar University, Coimbatore
- Dr. Sharathchandra Pankanti, IBM T J Watson Research Centre, Yorktown Heights, NY
- Dr. Nanda Kambhatla, STSM & Senior Manager, Cognitive Solutions and Services, IBM Research - India, Bangalore
- Dr. N B Vineeth, Department of Computer Science and Engineering, IIT, Hyderabad
- Prof. Uma Mudenagudi, Bhoomaraddi College of Engg. & Tech., Hubli
- Dr. S Balasubramanian, Asst. Professor, DMACS, SSSIHL
- Dr. Sumohana Channappayya, Dept. of Electrical Engineering, IIT Hyderabad
- Dr. Vidit Jain, Senior Research Scientist, Yahoo Labs, Bangalore
- Dr. M C Prakash, Machine Learning Specialist, Dow Agro Sciences
- Mr. Praveen Krishnakumar, Data Scientist, Search Engine Marketing, Google Inc.
- Mr. Suresh Marru, Extreme Science and Engineering Discovery Environment (XSEDE), Pervasive Technology Institute, Indiana University