

## ▶ Dr. Avinash Kumar Singh

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Other Links: [Google Scholar](#), [LinkedIn](#), [YouTube](#).

### Education

#### Ph.D. (2016)

Indian Institute of Information Technology, Allahabad, India

- ▶ Specialization in Human Robot Interaction
- ▶ Course Work: Soft Computing, Image Processing, Machine Learning, Robotics and Industrial Automation, Research Methodology
- ▶ Obtained 9.0 CGPI

#### M.Tech. (2011)

K.I.I.T University, Bhubaneswar, Odisha, India

- ▶ Specialization in Information Security
- ▶ Obtained 8.91 CGPI

#### MSc. (2009)

Kumaun University Nanital, Uttarakhand, India

- ▶ Specialization in Information Technology
- ▶ Obtained 76%

#### BSc. (2007)

Kumaun University Nanital, Uttarakhand, India

- ▶ Specialization in Mathematics, Chemistry, Information Technology
- ▶ Obtained 65%

### Experience

#### Research Experience (November, 2011 –November, 2015)

Indian Institute of Information Technology, Allahabad, India.  
Designed and developed algorithms for Human-Robot Interaction

#### Industrial Experience (November, 2015 –Till Now)

eClerx, Services, Limited, Navi Mumbai, India.  
Worked on Optical Character Recognition, Natural Language Processing and Machine Learning.

## Technical Skills

- Machine Learning (Bayes Classifier, Artificial Neural Network, Convolutional Neural Network, Support Vector Machine, Logistic Regression, Linear Regression, Clustering, Linear Discriminant Analysis, Principal Component Analysis)
- Computer Vision (Stereovision, Object Detection, Face Recognition, Scale Invariant Feature Transform, Optical Character Recognition)
- Image Processing (Segmentation, Edge Detection, Denoising, Morphological Processing, Image Enhancement )
- Natural Language Processing (Named Entity Recognition, Part of Speech Taggers, Anaphora Resolution, Email Classification, TF-IDF, N-gram Language Modelling)
- Robotics (Manipulator Design, Inverse Kinematics, NAO Humanoid Robot, Robot Sketch Drawing, Human Robot Interaction)

## Tools Used

- Machine Learning (Python/MATLAB/TensorFlow)
- Computer Vision (OpenCV/MATLAB/VC++)
- Image Processing (Python/OpenCV/MATLAB/VC++)
- Natural Language Processing (NLTK, SCIKIT, Numpy, Pandas)
- Robotics (Webots/Choregraphe/ MATLAB/Hardware Interfacing)

## Academic Projects

- Visual perception-based criminal identification.  
**Abstract:** The visual perception of eyewitness plays a vital role in criminal identification scenario. It helps law enforcement authorities in searching particular criminal from their previous record. We have proposed a query-based approach which minimizes the computational cost along with the reduction of search space.  
**Techniques:** Knowledge Acquisition and Representation, Rough Set Theory, Decision Tree Classifier.  
**Publications:**  
[1] Singh, Avinash Kumar, and G. C. Nandi. "Visual perception-based criminal identification: a query-based approach." *Journal of Experimental & Theoretical Artificial Intelligence* (2016): Vol. 6, Issue. 1, pp 1-22. SCI, Impact Factor: 1.703  
[2] Singh, Avinash Kumar, and G.C. Nandi. "Visual perception based criminal identification: a rough set based approach." *International journal of machine learning and cybernetics*. SCI, Impact Factor: 1.110 (In Press)
- NAO humanoid robot sketch drawing.  
**Abstract:** The proposed approach addresses the fundamental issue of defining a relationship between the NAO humanoid image plane (camera plane) and its end effector position (hand). This relationship enables NAO to perceive points of image plane with respect to its body coordinate system.

**Techniques:** Artificial Neural Network based regression analysis, Gradient Descent, Numerical Analysis, Computer Vision-Connected Component Labeling, Edge Detection, Inverse Kinematics, Forward Kinematic, Robotics.

**Publications:**

- [1] Singh, Avinash Kumar, and G. C. Nandi. "NAO humanoid robot: Analysis of calibration techniques for robot sketch drawing." *Robotics and Autonomous Systems* (2016): Vol. 79, pp. 108-121. SCI, Impact Factor: 1.618
- [2] Singh, Avinash Kumar, Pavan Chakraborty, and G. C. Nandi. "Sketch drawing by NAO humanoid robot." *TENCON 2015-2015 IEEE Region 10 Conference*. IEEE, 2015.
- [3] Singh, Avinash kumar, Neha Baranwal and G. C. Nandi, "Development of a self-reliant humanoid robot for sketch drawing." *Journal of multimedia tools and applications*. SCI, Impact Factor: 1.331(In Press)

► Face Recognition.

**Abstract:** Face recognition has various open challenges such as change in facial expression, variable light condition, occlusion, orientation and time complexity. We have proposed facial symmetry and macro component based face recognition techniques to handle some of these uncertainties.

**Techniques:** Principal Component Analysis, Linear Discriminant Analysis, Artificial Neural Network.

**Publications:**

- [1] Singh, Avinash Kumar, and Gora Chand Nandi. "Face recognition using facial symmetry." *Proceedings of the Second International Conference on Computational Science, Engineering and Information Technology*. ACM, 2012.
- [2] Singh, Avinash Kumar, et al. "Expression invariant fragmented face recognition." *Signal Propagation and Computer Technology (ICSPCT), 2014 International Conference on*. IEEE, 2014.

► Anti-Face Spoofing.

**Abstract:** Face spoofing is an attack where attacker tries to impersonate the identity of the legitimate user by showing his/her photograph/video/mask in front of the camera. We have proposed face texture, facial movements and face depth perception based analysis techniques to detect the liveness of the person.

**Techniques:** Face detection, Haar classifier for object detection, Local Binary Pattern, Linear Classifier, Stereovision, Point Cloud, 3D Face Visualization, Fuzzy Inference System, C-Means.

**Publications:**

- [1] Singh, Avinash Kumar, Piyush Joshi, and Gora Chand Nandi. "Face recognition with liveness detection using eye and mouth movement." *Signal Propagation and Computer Technology (ICSPCT), 2014 International Conference on*. IEEE, 2014.
- [2] Singh, Avinash Kumar, Piyush Joshi, and G. C. Nandi. "Face liveness detection through face structure analysis." *International Journal of Applied Pattern Recognition* 1.4 (2014): 338-360. ESCI

- [3] Singh, Avinash Kumar, Piyush Joshi, and G. C. Nandi. " Development of a Fuzzy Expert System based Liveliness Detection for Biometric Authentication." Elsevier science and technology (2013), Vol. 4, pp. 96-103.

## Industry Projects

- Email Classification  
**Abstract:** The document classification system utilizes the below said features to represent the document while Linear, Naïve Bayes, Support Vector Machines are used to classify these document to one of the defined classes. The current system is deployment to one of the client and it is working in the real time to classify the emails.  
**Techniques:** TD-IDF, Bayes (Multinomial, unigram), Linear Classifier, SVM.  
**Platform:** Python, Scikit, Numpy, Beautifulsoap, NLTK, SQL
  
- Email Content Extraction  
**Abstract:** The system is designed to extract particular values from the email. There are four parameters such as field type, background, context are needs to be configured in order to extract the particular field values. The current system is deployed to extract particular values from the email and it is working in real time for one of the client.  
**Techniques:** POS Taggers, Named Entity Extraction, Data Mining  
**Platform:** Python, NLTK, Stanford NER, SQL
  
- Anaphora Resolution  
**Abstract:** The objective of the anaphora resolution to extract those sentences out of a document which is relative or belong to the particular entity. The current system is designed for KYC (Know Your Client) and it is in use for one of the company processes.  
**Techniques:** POS Taggers, Named Entity Extraction, Data Mining  
**Platform:** Python, NLTK, Stanford NER
  
- Relative Page Extractor  
**Abstract:** The Natural Language Processing and Machine Learning are used to identify the relative pages in the document. The system is trained with 100 (Pdf document) magazine's cricket pages. The document consist additional sections such as Bollywood, Politics, etc. With respect to each Pdf, we have to define relative pages where the cricket news lies. Once the system is trained, it can predict the cricket pages in the text pdf (magazine)  
**Techniques:** POS Taggers, Named Entity Extraction, Data Mining  
**Platform:** Python, NLTK, Stanford NER

## Academic Achievements & Memberships

- Certified Professional Hacker by Techdefence.
- Got First rank in MSc (IT) at University level.

- Got 2nd position in M.Tech (Information Security) at University level.
- IEEE Professional Student Member.
- Official Mentor of IEEE in IIIT-Allahabad student chapter from June 2013.
- Chair of IEEE in IIIT- Allahabad student chapter from June 2014.
- Program Committee member of “Second International Conference of Networks and Communications (NC 2014)”, Sydney, Australia.
- Technical Program Committee member of “International Conference on Signal Propagation and Computer Technology”, organized by Government Engineering College Ajmer and Technically Sponsored by IEEE Delhi Section.
- Organizing committee member of “SERB sponsored 1st summer school on robotics”, organized by IIIT Allahabad.

### **Workshop and Certification Course Attended**

- Attended Microsoft Summer School on “**Distributed Algorithms, Systems, and Programming**” organized by Microsoft Research India, held at Indian Institute of Science (IISc) Bangalore from 28th May to 8 June 2012.
- Attended the National workshop cum training program on “**Computing Techniques and Applications (NWCTP-CTA)**” organized by Center for Mathematics of Banaras Hindu University Campus – Varanasi during July 01 – 07, 2012.
- Successfully completed Three Months “**Certificate Course on Machine Intelligence and Soft Computing**” with B+ grade offered by Center for Soft Computing Research (CSCR) of Indian Statistical Institute – Kolkata during September 21 – December 21, 2012.
- Attended 1st Indian Workshop on “**Machine Learning**” organized by Indian Institute of Technology, Kanpur, July 1 – 3, 2013.
- Attended Faculty Development Program on “**Image Processing, Computer Vision and Pattern Recognition**”, conducted from 18th June – 22nd June, 2013 at National Institute of Technology Delhi.
- Attended DAAD Supported International Workshop on Advances in “**PDE Modeling and Computation (APDEMC 2013)**” organized by Department of Mathematics Indian Institute of Technology Madras – Chennai during October 21-25 2013.

### **Invited Talks**

- Presented 3 day talk on “**Authentication Techniques and Web Application Security**” in a one week long (June 23-28, 2014) workshop on “Information Security and Computer Forensic (WISCF-2014)”, organized by Department of Computer Science & Engineering, Motilal Nehru National Institute of Technology Allahabad, Allahabad, India.

- Presented talk on “**Computer& Network Security**” in a one day workshop (September 7, 2014), at UPTEC Computer Consultancy Ltd Allahabad organized by Computer Society of India, Allahabad Chapter.
- Presented talk on “**Spoofing Attacks & System Security**” in a one day workshop (January 31, 2015), at Arcade Business College, Patna, Bihar, India organized by Ph.D. chamber of Commerce, India.
- Presented one day talk on “**Robotic Vision: Detection and Tracking**” in a one month long (June 8-July 5, 2015) summer school on “Emerging Trends in Computer (ETCS-2015)”, organized by Department of Computer Science & Engineering, Motilal Nehru National Institute of Technology Allahabad, Allahabad, India.

### Personal Profile

Mother's Name : Vibha Singh  
Father's Name : L. P. Singh  
Nationality : Indian  
Gender : Male  
Date of Birth : 28-December-1986  
Language Known : Hindi, English, Bengali.  
Mobile No : +919005722861  
Permanent Address : S/O L. P. Singh, House No: 610/1292, Kesav Nagar, Sitapur Road,  
Lucknow-226021, Uttar Pradesh

### Declaration

I hereby declare that the above mentioned particulars are true to the best of my knowledge and belief.

Place: Mumbai

Avinash Kumar Singh

Date: