**Aditya Nigam**
Visiting Assistant Professor
School of Computing and Electrical Engineering
Indian Institute of Technology Mandi - 175005

+918894607738,+919956772068
aditya-at-iitmandi.ac.in
http://www.cse.iitk.ac.in/users/naditya

## Education

- **Indian Institute of Technology** — Kanpur, INDIA
  *Ph.D., Computer Science and Engineering (Grade: 9 CPI)* — *Dec. 2009 - Feb. 2015*
  - Ph.D Thesis: Multimodal Biometric based Recognition System.
- **Indian Institute of Technology** — Kanpur, INDIA
  *M.Tech., Computer Science and Engineering (Grade: 9 CPI)* — *2007-2009*
  - M.Tech Thesis: A Novel Method for Face Recognition using $NUP$ measure.
- **Babu Banarasi Das National Inst. of Tech. and Management** — Lucknow, INDIA
  *B.E., Computer Science and Engineering (Grade: 80%)* — *1999-2003*
  - Graduated with Honors.

## Work Experience

- **Indian Institute of Technology [Post Ph.D]** — Mandi, INDIA
  *Visiting Assistant Professor* — *Feb 2015 - Till date*
  - Associated with Teaching and Research activities
  - Subjects : Data Structures, Communicating Distributed Processes, System and Design Practicum
- **Indian Institute of Technology [Post Ph.D]** — Mandi, INDIA
  *Teaching Fellow* — *Aug 2014 - Jan 2015*
  - Associated with Teaching and Research activities
  - Subjects : Computer Networks, System Practicum, Communicating Distributed Processes, Data Structures Lab
- **Indian Institute of Technology [During Ph.D]** — Kanpur, INDIA
  *Teaching Assistant* — *Dec 2009 - July 2014*
  - Teaching assistantship for IIT Kanpur undergraduate students
  - Subjects : Multi-modal Biometrics, C Programming, Computer Vision
- **Krishna Institute of Technology [Post M.Tech]** — Kanpur, INDIA
  *Assistant Professor* — *June 2009 - Dec. 2009*
  - Teaching second year undergraduate students
  - Subjects Taught: Data Structures.
- **Indian Institute of Technology [During M. Tech]** — Kanpur, INDIA
  *Teaching Assistant* — *September 2007 - May 2009*
  - Teaching assistantship for IIT Kanpur undergraduate students
  - Subjects : Multi-modal Biometrics, Computer Vision
- **Maharana Pratap Engineering Collage [Post B.E]** — Kanpur, INDIA
  *Lecturer* — *May 2003 - Aug. 2007*

- Teaching undergraduate final and pre final year students.
- Conducted many workshops and seminar including some IBM workshops.
- Subjects Taught : Computer Graphics, Computer Networks, Compiler Design, Automata theory, Numerical Analysis and Data Warehousing.

## Ph.D. Thesis

- **Multimodal Biometric based Recognition System** IITK, INDIA
  *Biometrics Lab, IITK* *2010-Till date*
  - Aim of my thesis work is to develop an accurate and efficient human personal authentication system by fusing iris, knuckleprint and palmprint biometric samples.

    * **Region of Interest (ROI) Extraction:** The data acquisition system captures the biometric samples (iris, knuckleprint and palmprint) and the region of interest (ROI) is extracted using the proposed algorithm for each trait.

      · Iris ROI Extraction [6] : Improved Hough and Integro-differential transformation is used in such a way that they can complement each other and segment the iris ROI efficiently and effectively.
      · Knuckleprint ROI Extraction : Gabor filter is modified to Curvature gabor filters (CG) and is used to segment the knuckleprint ROI.
      · Palmprint ROI Extraction : Landmark key-points are extracted and are used to segment the palmprint ROI.

    * **Quality Estimation and Enhancement:** The quality of the extracted biometric ROI plays a very significant role in the overall performance of any system. Hence several trait specific as well as general image based quality attributes are proposed.

      · Iris Quality Estimation [13] : The quality of an iris sample is modeled as a function of six attributes namely Focus, Motion Blur, Occlusion, Contrast and Illumination, Dilation, Specular Reflection.
      · Knuckleprint Quality Estimation [15] : The knuckleprint image quality is obtained by computing the amount of well focus edges, amount of clutter, distribution of focused edges, block-wise entropy of focused edges, reflection caused by light source or camera flash and the amount of contrast.
      · Palmprint Quality Estimation : The palmprint image quality is obtained by estimating the amount of three primary features namely palm principle lines, ridges and wrinkles.

    Later ROI's are normalized, enhanced and transformed (using local gradient based binary pattern) in order to obtain highly discriminative as well as robust texture representation.

    * **Feature Extraction and Matching :** The discriminative corner features are extracted and are matched. The matching algorithm uses the concept of sparse point tracking but under three constrains *viz.* vicinity, correlation and patch-wise error bounds. The proposed matching algorithm is parameterized and fine tuned to perform iris matching [9], knuckleprint matching [3,4] and palmprint matching [11].
    * **Multi-modal Fusion :** The matching scores obtained by applying the matching algorithm over iris, knucklprint and palmprint samples are fused (*i.e* score level fusion). This fused multi-modal score has shown very high discriminative power.

- Iris and Knuckleprint Fusion [16] : Iris and knuckleprint scores are fused.
- Palmprint and Knuckleprint Fusion [14,17] : Palm and knuckleprint scores are fused.
- Iris, Knuckle and Palmprint Fusion : Iris, knuckle and palmprint scores are fused.

* **Databases and Performance Analysis :** The performance of the proposed system is tested over several state of the art publicly available benchmark biometric databases of iris, knuckleprint and palmprint. Several chimeric multi-modal databases are created by fusing the biometric samples of existing unimodal biometric databases in order to test and justify the fusion of iris, knuckleprint and palmprint biometric samples. The standard performance parameters such as correct recognition rate ($CRR$), equal error rate ($EER$) and discriminative index ($DI$) are used for performance analysis for each proposed system.

## M.Tech Thesis

- **Face Recognition under Varying Environment** IITK, INDIA
  *Biometrics Lab, IITK* *2008-2009*
  - Aim of the work was to develop an algorithm that can recognize the face even when the query facial picture is not exactly frontal (*i.e* small amount of pose variation) also the background may be different than the gallery image (*i.e* any background) and lighting conditions may also vary.
  - We had developed two new distance measures [1, 2] for face recognition that shows significant improvement in recognition rates over the standard benchmark face databases such as Orl, Yale, Bern, Caltech and IITK.

## Publications

33. Aditya Nigam, Balender and Phalguni Gupta, ***"Automated Soft Contact Lens Detection Using Gradient based Information"*** in $11^{th}$ International Conference on Computer Vision Theory and Applications **(VISAPP)**, Rome, Italy, Feb 27-29, 2016

32. Balender, Aditya Nigam and Phalguni Gupta, ***"Fully Automated Soft Contact Lens Detection from NIR Iris Images"*** in $5^{th}$ International Conference on Pattern Recognition Applications and Methods **(ICPRAM)**, Rome, Italy, Feb 24-26, 2016

31. Aditya Nigam and Phalguni Gupta, ***"Finger-Knuckle-Print ROI Extraction Using Curvature Gabor Filter for Human Authentication"*** in $11^{th}$ International Conference on Computer Vision Theory and Applications **(VISAPP)**, Rome, Italy, Feb 27-29, 2016

30. Aditya Nigam and Phalguni Gupta, ***"Tri-Modal Biometric Fusion for Human Authentication by Tracking Differential Code Pattern"*** in $5^{th}$ National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics **(NCVPRIPG)**, at IIT Patna, India, Dec 16-19, 2015

29. Gitesh, Aditya Nigam and Phalguni Gupta, ***"Pose Invariant Face Recognition using Binocular Stereo 3D Reconstruction"*** in $5^{th}$ National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics **(NCVPRIPG)**, at IIT Patna, India, Dec 16-19, 2015

28. Aditya Nigam, Parvez Khan and Phalguni Gupta, ***"Fusion of Palmprint and Finger-Knuckle-Print for Human Personal Recognition"*** in IEEE Symposium Series on Computational Intelligence - IEEE Symposium on Computational Intelligence in Biometrics and Identity Management **(CIBIM)**, Cape Town, South Africa, Dec 8-10, 2015

27. Aditya Nigam, Balender Kumar, Jyoti Triyar and Phalguni Gupta, ***"Iris Recognition Using Discrete Cosine Transform and Relational Measures"*** in $16^{th}$ International Conference on Computer Analysis of Images and Patterns **(CAIP)**, Valetta, Malta, Sep 2-4, 2015

26. ■ Aditya Nigam, Kamlesh Tiwari and Phalguni Gupta, ***"Multiple Texture Information Fusion for Finger-Knuckle-Print Authentication System"*** in Journal of Neurocomputing, Elsevier (Impact Factor: 1.634)

25. Lovish, Aditya Nigam, Balender Kumar and Phalguni Gupta, ***"Robust Contact Lens Detection using Local Phase Quantization and Binary Gabor Pattern"*** in $16^{th}$ International Conference on Computer Analysis of Images and Patterns **(CAIP)**, Valetta, Malta, Sep 2-4, 2015

24. Yogesh Kumar, Aditya Nigam, Kamlesh Tiwari and Phalguni Gupta, ***"An automated multimodal biometric system and fusion"*** in IEEE Symposium on Computational Intelligence in Biometrics and Identity Management **(CIBIM)**, Florida, USA, December 9-12, 2014

23. Ankit Tandon, Aditya Nigam and Phalguni Gupta, ***"An Efficient Age-Invariant Face Recognition"*** in Software Intelligence Technologies Applications **(SIT)**, Hsinchu, Taiwan, Dec 4 - 6, 2014

22. Kamlesh Tiwari, Aditya Nigam, and Phalguni Gupta, ***"TARC: A novel score fusion scheme for multimodal biometric systems"*** in IEEE Symposium on Computational Intelligence in Biometrics and Identity Management **(CIBIM)**, Florida, USA, December 9-12, 2014

21. Rahul Ajmera, Aditya Nigam and Phalguni Gupta, ***"3D Face Recognition using Kinect"*** in International Conference on Vision, Graphics and Image Processing **(ICVGIP)**, IISC Bangalore, INDIA, Dec 14 - 17, 2014

20. Aditya Nigam and Phalguni Gupta, ***"Personal Authentication System using Ear"*** in HIS at $12^{th}$ Asian Conference on Computer Vision **(ACCV)**, Singapore, November 1 - 5, 2014

19. Aditya Nigam, Vamshi Krishna, Amit Bendale and Phalguni Gupta, ***"Iris Recognition Using Block Local Binary Patterns and Relational Measures"*** in International Joint Conference on Biometrics **(IJCB)**, Clearwater, Florida, USA, 29 Sep - 2 Oct, 2014

18. Aditya Nigam, Lovish, Amit Bendale and Phalguni Gupta, ***"Efficient Iris recognition using Relational Measures"*** in IWCF at International Conference on Pattern Recognition **(ICPR)**, Stockholm, Sweden, August 24-28, 2014

17. ■ Aditya Nigam and Phalguni Gupta, ***"Designing An Accurate Hand Biometric Based Authentication System Fusing Finger Knuckleprint with Palmprint"*** in Journal of Neurocomputing, Elsevier (Impact Factor: 1.634)

16. Vandana Dixit Kaushik, Amit Bendale, Aditya Nigam and Phalguni Gupta, ***"Certain Reduction Rules Useful for De-Duplication Algorithm of Indian Demographic Data "*** in $4^{th}$ International Conference on Advanced Computing and Communication Technologies **(ACCT)**, Rohtak, India, Feb 8 - 9, 2014

15. Aditya Nigam and Phalguni Gupta, ***"Quality Assessment of Knuckleprint Biometric Images"*** in IEEE $20^{th}$ International Conference on Image Processing **(ICIP 2013)**, Melbourne, Australia, September 15-18, 2013

14. Aditya Nigam and Phalguni Gupta, ***"Multimodal Personal Authentication System Fusing Palmprint"*** in $9^{th}$ International Conference on Intelligent Computing **(ICIC 2013)**, Nanning, China, July 28-31, 2013

13. Aditya Nigam, Anvesh T. and Phalguni Gupta, ***"Iris Classification Based on its Quality"*** in $9^{th}$ International Conference on Intelligent Computing **(ICIC 2013)**, Nanning, China, July 28-31, 2013

12. Shubham Jain, Aditya Nigam and Phalguni Gupta, ***"Age-Invariant Face Recognition using Shape Transformation"*** in $9^{th}$ International Conference on Intelligent Computing **(ICIC 2013)**, Nanning, China, July 28-31, 2013

11. Aditya Nigam and Phalguni Gupta, ***"Palmprint Recognition using Geometrical and Statistical Constraints"*** in International Conference on Soft Computing for Problem Solving **(SocProS 2012)**, Jaipur, India, December 28-30, 2012

10. Nishant Singh, Kamlesh Tiwari, Aditya Nigam and Phalguni Gupta, ***"Fusion of 4-slap fingerprint images with their qualities for human recognition"*** in 2012 World Congress on Information and Communication Technologies **(WICT-2012)**, Trivandrum, India, October 30 - November 2, 2012.

9. Aditya Nigam and Phalguni Gupta, ***"Iris Recognition using Consistent Corner Optical Flow"*** in $11^{th}$ Asian Conference on Computer Vision **(ACCV 2012)**, Daejeon, Korea, November 5-9, 2012.

8. Nishant Singh, Aditya Nigam, Puneet Gupta and Phalguni Gupta, ***"Four Slap Fingerprint Segmentation"*** in $8^{th}$ International conference on Intelligent Computing **(ICIC 2012)**, Huangshan, China, July 25-29, 2012.

7. Vandana Dixit Kaushik, Amit Bendale, Aditya Nigam, Phalguni Gupta, ***"An Efficient Algorithm for De-duplication of Demographic Data"*** in $8^{th}$ International conference on Intelligent Computing **(ICIC 2012)**, Huangshan, China, July 25-29, 2012.

6. Amit Bendale, Aditya Nigam, Surya Prakash and Phalguni Gupta, ***"Iris Segmentation using an Improved Hough Transform"*** in $8^{th}$ International conference on Intelligent Computing **(ICIC 2012)**, Huangshan, China, July 25-29, 2012.

5. Jeet Kumar, Aditya Nigam, Surya Prakash, Phalguni Gupta, ***"An Efficient Pose Invariant Face Recognition System"*** in International Conference on Soft Computing for Problem Solving **(SocProS 2011)**, IIT Roorkee, INDIA, December 20-22, 2011.

4. Aditya Nigam and Phalguni Gupta ***"Knuckleprint Recognition using Feature Tracking"*** in $6^{th}$ Chinese Conference on Biometric Recognition (**CCBR 2011**), Beijing, China, December 3-4, 2011.

3. G.S Badrinath, Aditya Nigam and Phalguni Gupta, ***"An Efficient Finger-knuckle-print based Recognition System Fusing SIFT and SURF Matching Scores"*** in $13^{th}$ International Conference on Information and Communications Security (**ICICS 2011**), Beijing, China, 23-26 November, 2011.

2. Aditya Nigam , Phalguni Gupta ***"Comparing Human Faces using Edge Weighted Dissimilarity Measure"*** in $11^{th}$ International Conference on Control, Automation,Robotics and Vision (**ICARCV 2010**) Singapore December, 2010.

1. Aditya Nigam , Phalguni Gupta ***"A New Measure for Face Recognition System"*** in $5^{th}$ International Conference on Image and Graphics (**ICIG 2009**), Xi'an, China, September, 2009