

Chandranath Adak

CONTACT INFORMATION

Centre for Artificial Intelligence,
CIBCI Lab, CB11.06.400, FEIT,

University of Technology Sydney
81 Broadway, NSW-2007, Australia.

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RESEARCH INTERESTS

Image Processing, Pattern Recognition, Document Image Analysis, Computer Vision, Data Science, and Machine Learning-related subjects.

EDUCATION

Ph.D. in Analytics

May 2019

@ Faculty of Engg. & IT, University of Technology Sydney, Australia.

— *Thesis Title*: “A Study on Automated Handwriting Understanding”.

— *Supervisor*: Prof. Michael Blumenstein, University of Technology Sydney, Australia.

— *Co-Supervisor*: Prof. Bidyut B. Chaudhuri, Indian Statistical Institute, Kolkata, India.

— *Co-Supervisor*: Prof. Chin-Teng Lin, University of Technology Sydney, Australia.

M.Tech. in Computer Science and Engineering

June 2014

@ Dept. of Computer Sc. & Engg., University of Kalyani, India.

— *DGPA*: 8.78 out of 10.

— *Thesis Title*: “Distinguishing Text, Strike-through and Doodles in Handwritten Manuscript”.

— *Supervisor*: Prof. Bidyut B. Chaudhuri, Indian Statistical Institute, Kolkata, India.

B.Tech. in Computer Science and Engineering

June 2012

@ West Bengal University of Technology, India.

— *DGPA*: 8.79 out of 10.

— *Final Year Project*: “Rule-based Machine Translation from English to Bengali Language”.

— *Supervisor*: Asst./Prof. Moley Dhar, Guru Nanak Institute of Technology, Kolkata, India.

Higher Secondary (10+2 level)

June 2008

@ West Bengal Council of Higher Secondary Education, India.

— *Marks*: 84.85% (Science Group: 87.75%).

Secondary (10 level)

June 2006

@ West Bengal Board of Secondary Education, India.

— *Marks*: 89.25% (Science Group: 95.33%).

RESEARCH & WORK EXPERIENCE

CIBCI Lab, University of Technology Sydney, Australia

↔ Researcher, PI

Mar. 2019 - Present

— *Project*: “Adversarial Autonomous Cyber Operations based on Hierarchical Multi-agent Deep Reinforcement Learning”.

— *Government Partner*: DSTG, Dept. of Defence, Edinburgh-5111, Australia.

— *Advisor*: Prof. Chin-Teng Lin, University of Technology Sydney, Australia.

Faculty of Engg. & IT, University of Technology Sydney, Australia

- ↔ HDR Post-Thesis Industry Scholar **Jan. 2019 - Mar. 2019**
 — *Project*: “DistressSpotter”.
 — *Industry Partner*: The Ripper Group, Sydney-2000, Australia.
 — *Advisor*: Prof. Michael Blumenstein, University of Technology Sydney, Australia.
- School of Software, FEIT, University of Technology Sydney, Australia**
 ↔ Research Associate **Feb. 2018**
 — *Topic*: “Computer-assisted Investigation on Handwriting Pattern”.
 — *Advisor*: Prof. Michael Blumenstein, University of Technology Sydney, Australia.
- IIIS, School of ICT, Griffith University, Gold Coast, Australia.**
 ↔ Higher Degree Research Candidate **Apr. 2015 - Feb. 2018**
 — *Topic*: “Automated Handwriting Analysis”.
 — *Advisor*: Prof. Michael Blumenstein, University of Technology Sydney, & Adjunct Professor, Griffith University, Australia.
- AI Lab, DINFO, University of Florence, Italy.**
 ↔ Visiting Researcher **Jul. 2017 - Sep. 2017**
 — *Project*: “Adaptive Metaheuristic Deep Learning for Study towards Human Cognition using Complex Handwriting Pattern”.
 — *Grant*: IEEE CIS (Computational Intelligence Society) Graduate Student Research Grants, 2017.
 — *Advisor*: A/Prof. Simone Marinai, University of Florence, Italy.
- School of Software, University of Technology Sydney, Australia**
 ↔ Visiting Scholar **Feb. 2017**
 — *Topic*: “Legibility and Aesthetic Analysis of Handwriting”.
 — *Advisor*: Prof. Michael Blumenstein, University of Technology Sydney, Australia.
- School of Software, University of Technology Sydney, Australia**
 ↔ Visiting Scholar **Mar. 2016**
 — *Topic*: “Handwritten Document Image Inspection”.
 — *Advisor*: Prof. Michael Blumenstein, University of Technology Sydney, Australia.
- CVPR Unit, Indian Statistical Institute, Kolkata, India.**
 ↔ Visiting Scholar **Sep. 2015 - Feb. 2016**
 — *Topic*: “Handwritten Document Preprocessing and Writer Identification”.
 — *Advisor*: Prof. Bidyut B. Chaudhuri, Indian Statistical Institute, Kolkata, India.
- CVPR Unit, Indian Statistical Institute, Kolkata, India.**
 ↔ Research Project-linked Personnel **Jun. 2014 - Mar. 2015**
 — *Project*: “Bangla Handwritten Text Image Corpus with Ground-Truth”.
 — *Advisor*: Prof. Bidyut B. Chaudhuri, Indian Statistical Institute, Kolkata, India.
- CVPR Unit, Indian Statistical Institute, Kolkata, India.**
 ↔ Research Trainee **Aug. 2012 - Jun. 2014**
 — *Topic*: “Doodle and Struck-out Text Extraction from Manuscript”.
 — *Advisor*: Prof. Bidyut B. Chaudhuri, Indian Statistical Institute, Kolkata, India.
- Future Tech, Kolkata, India.**

↔ Summer Intern **Jun. 2011 - Jul. 2011**
— *Project*: “Niharika: An Orphanage, Information System”.
— *Advisor*: Mr. Shibaji Paul, Future Tech, Kolkata-700113, India.

Future Tech, Kolkata, India.

↔ Practical Trainee **Jun. 2010 - Aug. 2011**
— *Project*: “National Institute of Behavioral Science (www.nibsindia.org) Information System”.
— *Advisor*: Mr. Shibaji Paul, Future Tech, Kolkata-700113, India.

TEACHING
EXPERIENCE

School of Software, FEIT, University of Technology Sydney, Australia

↔ Instructor **Autumn 2018**
— *Subject code*: #31250: “Introduction to Data Analytics” (Undergraduate).
— *Subject code*: #32130: “Fundamentals of Data Analytics” (Postgraduate).

↔ Tutor **Autumn 2019**
— *Subject code*: #32555: “Fundamentals of Software Development” (Postgraduate).

REFEREED
PUBLICATIONS

► **Journals** :

[25] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*An Empirical Study on Writer Identification & Verification from Intra-variable Individual Handwriting*”, **IEEE Access** Journal, vol. 7, no. 1, pp. 24738-24758, 2019.

[24] B. B. Chaudhuri[†], C. Adak[†], “*An Approach for Detecting and Cleaning of Struck-out Handwritten Text*”, **Pattern Recognition**, vol.61, pp.282-294, January 2017. [†]**Joint first author**.

► **Conferences** :

[23] C. Adak, B. B. Chaudhuri, C. T. Lin, M. Blumenstein, “*Detecting Named Entities in Unstructured Bengali Manuscript Images*”, Proc. 15th Int. Conf. on Document Analysis and Recognition (**ICDAR**), Sydney, Australia, 20-25 Sep., 2019. (*Accepted*)

[22] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*A Study on Idiosyncratic Handwriting with Impact on Writer Identification*”, Proc. 16th Int. Conf. on Frontiers in Handwriting Recognition (**ICFHR**), pp. 193-198, Niagara Falls, USA, 5-8 Aug., 2018.

[21] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*Cognitive Analysis for Reading and Writing of Bengali Conjunctions*”, Proc. 31st Int. Joint Conference on Neural Networks (**IJCNN**), pp. 1-7, Rio de Janeiro, Brazil, 8-13 July, 2018.

[20] C. Adak, S. Marinai, B. B. Chaudhuri, M. Blumenstein, “*Offline Bengali Writer Verification by PDF-CNN and Siamese Net*”, Proc. 13th Int. Workshop on Document Analysis Systems (**DAS**), pp. 381-386, Vienna, Austria, 24-27 Apr., 2018.

[19] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*Legibility and Aesthetic Analysis of Handwriting*”, Proc. 14th Int. Conf. on Document Analysis and Recognition (**ICDAR**), pp. 175-182, Kyoto, Japan, 9-15 Nov., 2017.

[18] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*Impact of Struck-out Text on Writer Identification*”, Proc. 30th Int. Joint Conf. on Neural Networks (**IJCNN**), pp. 1465-1471, Anchorage, Alaska, USA, 14-19 May, 2017.

- [17] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*Writer Identification by Training on One Script but Testing on Another*”, Proc. 23rd Int. Conference on Pattern Recognition (**ICPR**), pp. 1148-1153, Cancun, Mexico, 4-8 Dec., 2016.
- [16] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*Offline Cursive Bengali Word Recognition using CNNs with a Recurrent Model*”, Proc. 15th Int. Conf. on Frontiers in Handwriting Recognition (**ICFHR**), pp. 429-434, Shenzhen, China, 23-26 Oct., 2016.
- [15] C. Adak, B. B. Chaudhuri, M. Blumenstein, “*Named Entity Recognition from Unstructured Handwritten Document Images*”, 12th Int. Workshop on Document Analysis Systems (**DAS**), pp.375-380, Santorini, Greece, 11-14 Apr., 2016.
- [14] C. Adak, P. Maitra, B. B. Chaudhuri, M. Blumenstein, “*Binarization of Old Halftone Text Documents*”, Proc. **IEEE TENCN**, IEEE Conf. #35439, pp.1-5, Macau, China, 1-4 Nov., 2015.
- [13] C. Adak, B. B. Chaudhuri, “*Writer Identification from Offline Isolated Bangla Characters and Numerals*”, Proc. 13th Int. Conf. on Document Analysis and Recognition (**ICDAR**), pp.486-490, Nancy, France, 23-26 Aug., 2015.
- [12] C. Adak, B. B. Chaudhuri, “*An Approach of Strike-through Text Identification from Handwritten Documents*”, Proc. 14th Int. Conf. on Frontiers in Handwriting Recognition (**ICFHR**), pp.643-648, Heraklion, Greece, 1-4 Sep., 2014.
- [11] C. Adak, B. B. Chaudhuri, “*Text Line Identification in Tagore’s Manuscript*”, Proc. **IEEE TechSym**, IEEE Conf. #32812, pp.210-213, Kharagpur, India, 28 Feb.-2 Mar., 2014.
- [10] C. Adak, “*A Bilingual Machine Translation System: English & Bengali*”, Proc. Int. Conf. on Automation, Control, Energy and Systems (**ACES**) - IEEE Conf. #32377, India, 1-2 Feb., 2014.
- [9] C. Adak, “*An Approach for Printed Document Labeling*”, Proc. Int. Conf. on Automation, Control, Energy and Systems (**ACES**) - IEEE Conf. #32377, Hooghly, India, 1-2 Feb., 2014.
- [8] C. Adak, B. B. Chaudhuri, “*Extraction of Doodles and Drawings from Manuscripts*”, Proc. 5th Int. Conf. on Pattern Recognition and Machine Intelligence (**PRMI**), LNCS #8251, Springer-Heidelberg, pp.515-520, Kolkata, India, 10-14 Dec., 2013.
- [7] C. Adak, “*OPTICS Based Coverage in Wireless Sensor Network*”, Proc. Int. Conf. on Facets of Uncertainties and Applications (**ICFUA**), Kolkata, India, 05-07 Dec., 2013.
- [6] C. Adak, “*Gabor Filter and Rough Clustering Based Edge Detection*”, Proc. Int. Conf. on Human Comp. Interactions (**ICHCI**) - IEEE Conf. #30853, Chennai, India, 23-24 Aug., 2013.
- [5] C. Adak, “*Unsupervised Text Extraction from G-Maps*”, Proc. Int. Conf. on Human Comp. Interactions (**ICHCI**) - IEEE Conf. #30853, Chennai, India, 23-24 Aug., 2013.
- [4] C. Adak, “*Rough Clustering Based Unsupervised Image Change Detection*”, Proc. Int. Conf. on Human Comp. Interactions (**ICHCI**) - IEEE Conf. #30853, Chennai, India, 23-24 Aug., 2013.
- [3] C. Adak, “*An Advanced Approach for Rule Based English to Bengali Machine Translation*”, Proc. Nat. Conf. on Adv. of Comp. in Engg. Research (**ACER**), AIRCC Pub. Co., ISBN: 978-1-921987-11-3, vol.3, no.2, pp.1-9, 2013.
- [2] C. Adak, “*Robust Steganography Using LSB-XOR and Image Sharing*”, Proc. Int. Conf. on Comp. and Comm. Advancement (**IC3A**), ISBN (13): 978-1-25-906393-0, McGraw Hill, pp.97-102,

2013.

[1] C. Adak, “Dual Layer Textual Message Cryptosystem with Randomized Sequence of Symmetric Key”, Proc. Ethical Hacking - Issues & Challenges (**EHIC**), The Bulletin of Engg. & Science, ISSN: 0974-7176, vol.4, no.2, pp.1-3, 2012.

TECHNICAL
REPORTS/
NON-REFEREED
PUBLICATIONS/
POSTERS

[3] C. Adak, S. Marinai, M. Blumenstein, B. B. Chaudhuri, “Adaptive Metaheuristic Deep Learning for Study towards Human Cognition using Complex Handwriting Pattern”, Report of the **IEEE CIS** (Computational Intelligence Society) Graduate Student Research Grants, 2017.

[2] C. Adak, B. B. Chaudhuri, M. Blumenstein, “Automated Handwriting Analysis on Unconventional Documents”, **ICDAR** (Int. Conf. on Document Analysis and Recognition) Doctoral Consortium, Kyoto, Japan, 12 Nov., 2017.

[1] C. Adak, B. B. Chaudhuri, M. Blumenstein, “An Autonomous Cognitive System for Content Analysis of Questioned Handwritten Documents”, Invitational Symposium on Trusted Autonomous Systems (**ISTAS**) Student Poster Competition, org. by Defence Science and Technology Group, Australian Government, 2016. [**Top-10 finalist**].

ACHIEVEMENTS
& HONORS

► **Grants :**

- Centre for AI and School of Software, FEIT, *Publication Grant*, University of Technology Sydney, Australia, 2019.
- School of Software, FEIT, *Higher level of Funding Support*; and Centre for AI, *Conference Travel Grant*, University of Technology Sydney, Australia, 2018.
- Vice-Chancellor’s Postgraduate Research Student *Conference Fund*, University of Technology Sydney, Australia, 2018.
- **IEEE CIS** (Computational Intelligence Society) *Graduate Student Research Grants*, 2017.
- GGRS-IEIS (Griffith Graduate Research School and International Experience Incentive Scheme) *Conference Travel Grants*, Australia, 2017.
- School of ICT (Information and Communication Technology), Griffith University, *Conference Funding*, Australia, 2017.
- IIS (Institute for Integrated and Intelligent Systems), Griffith University, *Conference Travel Grant*, Australia, 2016.
- GCAP (Gold Coast Association of Postgraduates) *Professional Development and Conference Funding*, Australia, 2015.

► **Competitions :**

- 1st in the signature and name component recognition task of “*ICFHR-2018 competition on Thai Student Signature and Name Component Recognition and Verification - TSNCRV 2018*”, USA, Aug. 2018.
- 1st runner-up in “*ICFHR 2018 Competition on Handwritten Document Image Binarization (H-DIBCO 2018)*”, USA, Aug. 2018.
- 1st runner-up in “*ICDAR2017 Competition on Recognition of Early Indian Printed Documents - REID 2017*”, Japan, Nov. 2017.
- *Entrepreneur’s Award* and *Best of Gold Coast Award*, GovHack, Australia, Jul. 2016.
- Top-10 finalist in “*ISTAS (Invitational Symposium on Trusted Autonomous Systems) Student Poster Competition*”, org. by Defence Science and Technology Group, Dept. of Defence, Australian Government, May 2016.
- 1st in the *recognition* task and 1st runner-up in *segmentation* task of “*ICB-2016 Sclera Segmentation and Recognition Benchmarking Competition: SSRBC-2016*”, Sweden, Jun. 2016.

- 1st in “Challenge on Coding (ChoCo): Intra-University coding competition”, org. by Dept. of CSE, University of Kalyani, India, Apr. 2013.
- Best Paper Award (1st) in “Ethical Hacking - Issues & Challenges (EHIC): Students’ Paper Contest” held at Dr. B.C. Roy Engg. College, Durgapur, under the technical sponsorship of IEEE Communication Society, Kolkata, and Internet Society, Kolkata, India, Nov. 2012.

► **Scholarships :**

- *HDR Post-Thesis Industry Scholarship*, FEIT, University of Technology Sydney, Australia, 2019.
- **Dr. Kalam Doctoral Scholarship** and *International Research Scholarship (IRS)*, University of Technology Sydney, Australia, 2018.
- *International Postgraduate Research Scholarship (IPRS)* and *Postgraduate Research Scholarship (PRS)*, Griffith University, Australia, 2015-2018.
- *National Scholarship* for qualifying in *Graduate Aptitude Test in Engineering (GATE-2012 in CS)*, India, 2012-2014.
- Two times *National Merit Scholarship* from MHRD (Ministry of Human Resource Development), India, on the basis of *Higher-Secondary* level exam, 2008-2012, and *Secondary* level exam, 2006-2008.

► **Academics :**

- Rank 2nd in M.Tech. from the Dept. of Computer Sc. & Engg., University of Kalyani, India, 2014.
- M.Tech Thesis, nominated for INAE (Indian National Academy of Engineering) Innovative Student Projects Award - 2014.
- Rank 3rd in B.Tech. from the Dept. of Computer Sc. & Engg., Guru Nanak Institute of Technology, Kolkata, India, 2012.

► **Professional :**

- Oracle Certified Professional, *Java SE 6 Programmer*, 2011.

PARTICIPATION
&
PRESENTATION*

- 16th International Conference on Frontiers in Handwriting Recognition (**ICFHR**), Niagara Falls, USA, 5-8 Aug., 2018. [Author]*
- 14th International Conference on Document Analysis and Recognition (**ICDAR**), Kyoto, Japan, 9-15 Nov., 2017. [Author]*
- 15th International Conference on Frontiers in Handwriting Recognition (**ICFHR**), Shenzhen, China, 23-26 Oct., 2016. [Author]*
- **GovHack**, Gold Coast, Australia, 29-31 July, 2016.
- **IEEE TechSym**, IEEE Conf. #32812, Kharagpur, India, 28 Feb.- 2 Mar., 2014. [Author]*
- International Conference on Automation, Control, Energy and Systems (**ACES**), IEEE Conf. #32377, Hooghly, India, 1-2 Feb., 2014. [Author]*
- 5th International Conference on Pattern Recognition and Machine Intelligence (**PRMI**), Kolkata, India, 10-14 Dec., 2013. [Author]*
- International Conference on Facets of Uncertainties and Applications (**ICFUA**), org. by ORSI, Kolkata Chapter and Dept. of Applied Mathematics, Calcutta University, India, 05-07 Dec., 2013. [Author]*
- International Conference on Human Computer Interactions (**ICHCI**), IEEE Conf. #30853, Chennai, India, 23-24 Aug., 2013. [Author]*
- National Conference on Advancement of Computing in Engineering Research (**ACER**), Krishnanagar, India, 22-23 Mar., 2013. [Author]*
- International Conference on Computation and Communication Advancement (**IC3A**), Kalyani, India, 11-12 Jan., 2013. [Author]*

- Students' Paper Contest: Ethical Hacking - Issues & Challenges (**EHIC**), Durgapur, India, 20 Nov., 2012. [Author, **Rank: 1st**]*

INVITED
TALK

Title: "Handwriting Analysis: A Study towards Human Cognition".
Venue: FEIT, University of Technology Sydney, Australia, on 21st March, 2016.

REFEREEING
ACTIVITIES

- Reviewer/ Sub-reviewer of the *journals*:
IEEE Transactions on Biometrics, Behavior, and Identity Science (TBIOM), ACM Transactions on Asian and Low-Resource Language Information Processing (TALLIP), Pattern Recognition (PR), International Journal on Document Analysis and Recognition (IJ DAR), Journal of Electronic Imaging, etc.
- Reviewer/ Sub-reviewer of the *conferences*:
ICDAR-2019, ICFHR-2018, ICDAR-2017, IEEE TENCON Conference-2016, Int. Conf. on AI and Pattern Recognition (AIPR 2014), etc.

PROFESSIONAL
MEMBERSHIPS

- Institute of Electrical and Electronics Engineers (IEEE)
— Graduate Student Member # 92472868
- International Association of Engineers (IAENG)
— Member # 137587
- Indian Unit for Pattern Recognition and Artificial Intelligence (IUPRAI)
— Life Member # L-158
- Cryptology Research Society of India (CRSI)
— Life Member # L/0568

TECHNICAL SKILLS

- Programming Language: C, C++, Java, MATLAB, Python, R.
- Computer Vision Library: OpenCV.
- Machine/Deep Learning Framework: Tensorflow, Keras, Caffe, PyTorch, etc.
- Reinforcement Learning Environment: OpenAI Gym, Unity ML.
- Data Analysis Software: KNIME, Weka, Tableau, Orange, etc.

HOBBY

Painting.
(Awarded 'Shilpa Visharad' (2006) and 'Shilpa Ratna' (2008) from 'Sarba Bharatiya Sangeet -O-Sanskriti Parishad', India, on completion of 5th and 7th year diploma respectively, in Art & Painting).

REFEREES

- **Prof. Michael Blumenstein**, FACS, SMIEEE,
Associate Dean (Research Strategy and Management),
FEIT, University of Technology Sydney, Australia-2007.
✉ michael.blumenstein@uts.edu.au
🏠 www.uts.edu.au/staff/michael.blumenstein
- **Prof. Bidyut Baran Chaudhuri**, Life Fellow IEEE, FIAPR, FTWAS, FNA, FNAE,
Former J. C. Bose Fellow, INAE Distinguished Professor, and Head,
CVPR Unit, Indian Statistical Institute, Kolkata, India-700108.
Pro Vice Chancellor, Techno India University, Kolkata, India-700091.
✉ bbcisical@gmail.com , bbc@isical.ac.in
🏠 www.isical.ac.in/~bbc/
- **Prof. Anirban Mukhopadhyay**, SMIEEE,
Dept. of Computer Science & Engg.,

University of Kalyani, West Bengal, India-741235.
✉ anirbanbuba@yahoo.com , anirban@klyuniv.ac.in
🏠 www.anirbanm.in/