Plaban Kumar Bhowmick

G S Sanyal School of Telecommunications
Jointly with Center of Excellence in Artificial Intelligence
Indian Institute of Technology Kharagpur
Kharagpur, India - 721302
Phone: +91 9475196286
plaban@cet.iitkgp.ac.in

EDUCATION

- **Indian Institute of Technology Kharagpur**, India
  (January 2006 - August 2011)
  Degree: Doctor of Philosophy (Computer Science and Engineering).

- **Indian Institute of Technology Kharagpur**, India
  (2002 - 2005)
  Degree: Master of Science (Computer Science and Engineering).

- **University of Calcutta**, Kolkata, India
  (September 1999 - June 2002)
  Degree: B.Tech. (Computer Science and Engineering)

WORK EXPERIENCE

- **Assistant Professor**, GSSST and CoEAI, IIT Kharagpur since Nov 2020
- **Assistant Professor**, CET, IIT Kharagpur from April 2013 Nov 2020
- **Scientist** in TCS Innovation Labs Kolkata from May 2011 to April 2013
- **Assistant Professor** in the Department of Computer Science & Engineering, Birla Institute of Technology Mesra from April, 2010 to May 2011.

RESEARCH & DEVELOPMENT EXPERIENCE

My primary research experience concerns application artificial intelligence and natural language processing techniques to enhance learning experience. The notable contributions in this area are as follows:

- **Automated Answer Evaluation:** This work domain involves the use of natural language processing and graph algorithms for automatic grading and gap finding in short answers written by the learners.
- **Digital Library Research:** Several works in this area have been undertaken. I am the technical lead of the prestigious National Digital Library of India (NDLI) project sponsored by the Ministry of Human Resource Development (MHRD), Govt. of India. Different AI techniques have been used in automating different processes in digital library development and enhancing user experience.
- **Pedagogy Design Research:** An argument driven Inquiry pedagogy has been developed and deployed in a large number of schools in West Bengal.
- **Augmenting Learning Experience:** Different artificial intelligence techniques have been used to augment learning experience over the traditional forms of learning modalities. For example, video lectures and textbooks have been augmented with supplementary information automatically.
- **Graph Machine Learning:** We have started exploring graph machine learning approaches towards biological, NLP, social network problems.

ACADEMIC ACTIVITIES

I have been involved in several prestigious workshops, conferences and journals.

- The program chair of "**UNESCO-NDL International Workshop on Knowledge Engineering for Digital Library Design (KEDL 2017)**"
- The program chair of "**NDLI-UNESCO International Symposium on Knowledge Engineering for Digital Library Design (KEDL 2019)**"
- Program committee member of Joint Conference on Digital Library (JCDL 2020)
- Reviewer of IEEE Transactions on Learning Technologies, Natural Language Engineering, Springer-Nature Computer Science
- Program committee member of ACM CODS-COMAD
- Conducted 53 teacher training workshops on new pedagogy and ICT tools

TEACHING ACTIVITIES

I have been instructors of several courses that relate artificial intelligence with education

- **Language Processing for eLearning**
- **Intelligent Game Design**
- **Intelligent Tutoring System**
- **Artificial Intelligence**
- **Large-Scale Search Engines**
- **Knowledge Modelling & Semantic Web Technologies**
- **Graph Machine Learning**

RESEARCH PROJECTS

The list of projects includes

- Setting up of Teaching Learning Centre for Pedagogy Design and Research, Funded by MHRD, Govt of India (January 2016 – Till Date)
- Development of National Digital Library of India as a Digital Knowledge Asset of the Nation, Funded by MHRD, Govt of India (April 2015 – Till Date)
- Adaptive Interaction with Learning Material Repository through Analysis of Access Pattern, IBM Research (October 2015 – November 2018)
- Enhancing User Experience in Digital Library with Metadata Knowledge Graph, IBM Research (March 2018 – January 2020)

FELLOWSHIP & AWARDS

- Shared University Research (SUR) grant from IBM Research, 2015
- Best Technical Design Award in 24th International Conference on Computers in Education: Think Global Act Local - Main Conference Proceedings. (ICCE 2016)
- Shared University Research (SUR) grant from IBM Research, 2018

SELECTED JOURNAL PAPERSs

Selective Identification and Quantification of VOCs using Metal Nanoparticles Decorated SnO2 Hollow-Spheres based Sensor Array and Machine Learning by Acharyya S., Bhowmick P. K., & Guha P. K., Journal of Alloys and Compounds, 968(2), 1–14, (2023).

Researcher Influence Prediction (ResIP) using Academic Genealogy Network, by Singh D. K., Bhowmick P. K., & Paik J. H. Journal of Informetrics, 17(2), 1–19, (2023)

On the banks of Shodhganga: analysis of the academic genealogy graph of an Indian ETD repository by Singh D. K., Bhowmick P. K., Dey S. & Sanyal D. K., Scientometrics, 128, 3879–3914, (2023)

Semantics-Aware Query Expansion using Pseudo-Relevance Feedback by Singh P. K., & Bhowmick P. K., Journal of Information Science, 0(0), (2023).

Neural Network Guided Fast and Efficient Query-Based Stemming by Predicting Term Co-occurrence Statistics by Singh P. K., & Bhowmick P. K. SN Computer Science, 3(3), 198, (2022).

Augmenting Video Lectures: Predicting Off-topic Concepts and Linking to Relevant Video Lecture Segments by Ghosh K., Reddy S. , Kanchugantla Y. , Rayapati P. G., Bhowmick P. K., Goyal P. International Journal of Artificial Intelligence in Education (2022)

National digital library of India: democratizing education in India by Bhowmick P. K., Das P. P., Chakrabarti P. P. & Sanyal D. K. Communications of the ACM, 65(2), 58-61, (2022).

D. K. Sanyal, P. K. Bhowmick, P. P. Das, S. Chattopadhyay, T. Y. S. S. Santosh (2019). "Enhancing access to scholarly publications with surrogate resources", Scientometrics. vol. 121, no 2, 1129-1164.

P. K. Bhowmick, A. Sahu (2020). "Feature Engineering and Ensemble-based Approach for Improving Automatic Short-answer Grading Performance", IEEE Transactions on Learning Technologies, vol. 13, no. 1, 77-90.

D. K. Sanyal, P. K. Bhowmick, P. P. Das (2019). "A Review of Author Name Disambiguation Techniques for the PubMed Bibliographic Database", Journal of Information Science.

P. P. Das, P. P. Chakrabarti, P. K. Bhowmick, S. Sarkar (2016). "National Digital Library: Building a National Asset", Yojana, vol. 60 19-23.

P. P. Das, P. K. Bhowmick, S. Sarkar, B. Sutradhar, S. Chattopadhyay, A. Basu, S. K. Ghosh, N. G. Chattopadhyay, P. P. Chakrabarti (2016). "National Digital Library: A Platform for Paradigm Shift in Education & Research in India". Science and Culture vol. 82 4-11.

P. K. Bhowmick, A. Basu and P. Mitra (2010). "Do we agree? Measuring agreement on the human judgements in emotion annotation of news sentences", Journal of Cybernetics and Systems, vol. 41, no. 7, pp 469 - 488.

P. K. Bhowmick, A. Basu, P. Mitra and A. Prasad (2010). "Sentence level news emotion analysis in fuzzy multi-label classification framework", Special issue on Natural Language Processing and its Applications: Research in Computing Science, vol. 46, pp. 143 - 154.

T. Dasgupta, A. basu, P. K. Bhowmick and P. Mitra (2010) "A framework for the automatic generation of Indian Sign Language", Journal of Intelligent Systems, vol. 19, no. 2.

SELECTED CONFERENCE PAPERS

Jha N. K., Bhowmick P. K., & Bhagat K. K. (2023). Usability Evaluation of an Online Inquiry-based Learning Platform for Computational Thinking (CT-ONLINQ), The 23rd IEEE International Conference on Advanced Learning Technologies, 182-186.

T. Y. S. S. Santosh, Debarshi Kumar Sanyal, Plaban Kumar Bhowmick, Partha Pratim Das: Gazetteer-Guided Keyphrase Generation from Research Papers. PAKDD (1) 2021: 655-667

Santosh T., Sanyal D. K., Bhowmick P. K., Das P. P. (2020). SaSAKE: Syntax and Semantics Aware Keyphrase Extraction from Research Papers 28th International Conference on Computational Linguistics, COLING 2020 5372-5383.

Banerjee, S., Sanyal, D. K., Chattopadhyay, S., Bhowmick, P. K., & Das, P. P. (2020, August). Segmenting Scientific Abstracts into Discourse Categories: A Deep Learning-Based Approach for Sparse Labeled Data. In Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL).

Halder, K., Chattopadhyay, A., Sanyal, D. K., Bhowmick, P. K., & Das, P. P. (2020, August). Analysis of the Academic Genealogy of Education. In Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL).

Jhawar, K., Sanyal, D. K., Chattopadhyay, S., Bhowmick, P. K., & Das, P. (2020, August). Author Name Disambiguation in PubMed using Ensemble-Based Classification Algorithms. In Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL).

Santosh, T. Y. S. S., Sanyal, D. K., Bhowmick, P. K., & Das, P. P. (2020, April). DAKE: Document-Level Attention for Keyphrase Extraction. In Proceedings of the European Conference on Information Retrieval (ECIR) (pp. 392-401). Springer, Cham.

Poonam, A., Bhowmick, P. K. (2019). Learning to Retrieve Related Resources in a Bibliographic Information Network. JCDL 2019: 283-286

Nangi S. R., Kanchugantla Y. , Rayapati P. G., Bhowmick P. K. (2019). OffVid: A System for Linking Off-Topic Concepts to Topically Relevant Video Lecture Segments by IEEE International Conference on Advanced Learning Technologies (ICALT 2019) 37-41

Sadhu S., Bhowmick P. K. (2019). Metadata-Based Automatic Query Suggestion in Digital Library Using Pattern Mining. ICADL 2019: 213-226

Sadhu S., Bhowmick P. K. (2018). Automatic Segmentation and Semantic Annotation of Verbose Queries in Digital Library. TPDL 2018: 270-276

Akhtar S., Sanyal D. K., Chattopadhyay S., Bhowmick P. K., Das P. P (2018). A Metadata Extractor for Books in a Digital Library. ICADL 2018: 323-327

Ghosh K., Bhowmick P. K., Goyal P. (2017). Using re-ranking to boost deep learning-based community question retrieval. WI 2017: 807-814

Roy, S., Bhowmick, P. K. (2016). Augmenting online video lectures with topically relevant assessment items. ICCE 2016 - 24th International Conference on Computers in Education: Think Global Act Local - Main Conference Proceedings. 202-211 [**Best Technical Design Paper Award**]

A. Krishna, P. K. Bhowmick, A. Sahu, K. Ghosh, S. Roy, "Automatic Generation and Insertion of Assessment Items in Online Video Courses.", 20th International Conference on Intelligent User Interfaces Companion, 2014

P K Bhowmick, S Dey, A Samantaray, D Mukherjee, P Misra, "A temporal constraint based planning approach for city tour and travel plan generation"
Intelligent Human Computer Interaction (IHCI), 2012

P K Bhowmick, D Mukherjee, P Misra, A Basu, "Domain Recompilation-based Approach towards Hierarchical Task Network Planning with Constraints", Workshop on AI Problems and Approaches for Intelligent Environments, 2012

P. K. Bhowmick, A. Basu, P. Mitra (2010) "Determining reliability of subjective and multi-label emotion annotation through novel fuzzy agreement measure", *Proceedings of the seventh international conference on Language Resources and Evaluation (LREC-2010)*, Valletta, Malta, May, pp. 1095 - 1100.

P. K. Bhowmick, A. Basu, P. Mitra and A. Prasad (2010) "Sentence level news emotion analysis in fuzzy multi-label classification framework", *Proceedings of the 11th International Conference on Intelligent Text Processing and Computational Linguistics (CICLing-2010)*, Iasi, Romania, March.

S. Chakraborty, D. Roy, P. K. Bhowmick and A. Basu (2010). "An authoring system for developing Intelligent Tutoring System", *Proceedings of IEEE TechSym'10*, Kharagpur, India, pp. 196 - 205.

P. K. Bhowmick, A. Mukherjee, A. Banik, P. Mitra and A. Basu (2008). "A comparative study of the properties of emotional and non-emotional words in Wordnet: A complex network approach", *Proceedings of 6th International Conference on Natural Language Processing, ICON 2008*, Pune, December.

P. K. Bhowmick, A. Basu and P. Mitra (2008). "An agreement measure for determining interannotator reliability of human judgements on affective text", *Proceedings of Workshop on Human Judgements in Computational Linguistics, COLING 2008*, Manchester, August, pp. 58 - 65.

THESIS SUPERVISED

- Title: **Augmenting Learning Materials to Support Integrated and Multimodal Learning (PhD), 2022**
  Research Scholar: Krishnendu Ghosh
- Title: **Computational Models of Summative and Formative Assessment of Short Text Answers (PhD), 2020**
  Research Scholar: Sahu Archana Lambodara
- Title: **Automatic Semantic Analysis of Queries to Facilitate Digital Library Search (MS), 2021**
  Research Scholar: Susmita Sadhu
- Title: **Augmenting Online Video Lectures with Automatically Generated Questions (2020)**
  Research Scholar: Subhayan Roy
- Title: **Analytics and Recommendation Framework for Digital Library (MS), 2020**
  Research Scholar: Poonam Anthony
- Title: **Learning Dense Representations of Medical Subject Headings (MeSH) for Biological Information Mining (MS), 2020**
  Research Scholar: Atif Hasan
  Co-Supervisor: Dr. Pralay Mitra

OTHER PUBLICATIONS

- Bhowmick P. K., Das, P. P., Chakrabarti P.P., Roy S., Chattopadhyay, N. G. (2022), A Semi-Automated Workflow for Metadata Curation for Digital Library. Filed. **[Patent]**
- Ghose A., Pal A. , Dutta Choudhury A. , Chattopadhyay T. , Bhowmick P. K., Chattopadhyay D. (2020) Internet of things (IoT) application development (US10628136B2), USA, Granted **[Patent]**
- Maiti S., Mukherjee D. , Bhowmick P. K. (2015). "System and method for generating a plan to complete a task in computing environment" US9201692B2 2015-12-01, USA, Granted **[Patent]**
- P. K. Bhowmick (2018). "Stringing together Technology, Pedagogy and New Age Skills", Higher Education Review **[Education Magazine]**