

Tanmoy Mondal

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🌐 <https://mondal-tanmoy.github.io/>

in Tanmoy-Mondal

🐙 github

Expertise in :

Image Processing, Computer Vision, Time Series Analysis,
Machine Learning

Domains of Interests

Image Processing, Pattern Recognition, Computer vision, Time Series Analysis, Machine learning,
Parallel Computing

Education

- 2012–2015 **PhD in Computer Science**, *Laboratoire d'Informatique*, Ecole Polytechnique de l'Université de Tours (EPU), France
- 2007–2009 **M.Tech in Mechatronics & Robotics**, *Indian Institute of Engineering Science and Technology (IIST)*, Shibpur in collaboration with three units of CSIR - "Central Electronics Engineering Research Institute (CEERI), Pilani", "Central Scientific Instruments Organization (CSIO), Chandigarh", "Central Mechanical Engineering Research Institute (CMERI), Durgapur", India
Secured 71%
- 2003–2007 **B.Tech in Information Technology**, *West Bengal University of Technology*, West Bengal, India
DGPA 7.6/10

Thesis

- Juillet 2008–Aug. **Masters Thesis**, worked at : *Central Scientific Instruments Organization (CSIO)*, Chandigarh, India
- 2009 **Topic** : Automatic Craniofacial Structures and Landmark Detection on Cephalometric Images
Defended at : Central Scientific Instruments Organization (CSIO), Chandigarh, India

Guided by : [Dr. Harish Kumar Sardana](#), Senior Scientist at Central Scientific Instruments Organization (CSIO), Chandigarh, India.

- [Click here to see the thesis](#)

- Nov 2012– **PhD Thesis**, worked at : *RFAI team*, University of Tours, France
- Dec 2015 **Topic** : From Times Series Signal Matching to Word Spotting in Multilingual Historical Document Images
Defended at : RFAI team, PolyTech Tours, France
Date of PhD defense : 18 December, 2015
Grade : Très Honorable (Very honorable)
Guided by :
[Dr. Jean-Yves Ramel](#), Professor and Head of LIFAT Lab, University of Tours, France (**Thesis Director**)
[Dr. Nicolas Ragot](#), Associate Professor and team lead of RFAI, University of Tours, France (Thesis Co-director)
[Dr. Umapada Pal](#), Professor and Head of CVPR team, Indian Statistical Institute, Kolkata, India (Thesis Co-director)

Jury Members :

[Dr. Véronique Eglin](#), Professor and team lead of IMAGINE, LIRIS, INSA, Lyon, France

[Dr. Nicole Vincent](#), Professor, LIPADE team, University of Paris, France

[Dr. Basilis Gatos](#), Senior Researcher, Institute of Informatics and Telecommunications, Athens, Greece

- [Click here to see the thesis](#)

Professional Experience

Research & Development Experience in Industries

Jan-2023- Present
(10 Month) **Research Scientist in Computer Vision and Deep Learning**, VOGO, Grenoble , France

Subject #1 : Proper detection and localization of various objects like football, players, goalpost, corner lines etc. are needed for various applications e.g. automatic detection of “off-side” in football, analyzing the performance of any particular player etc. We are working on different state-of-the art object detection algorithms e.g. YOLO, RetinaNet etc.

Subject #2 : Sports field registration via detected key-points

Sports field registration refers to a process of estimating a homography transformation, which maps a 2D field template to a real-world field image, captured from an arbitrary camera viewpoint. A robust sports field registration could benefit a wide variety of applications in sports broadcasting, including augmented sports tactics analysis, virtual advertisements insertion etc. We are working on studying and understanding various state-of-the art methods on this topic.

Keywords : Object Detection, YOLO, Image Registration, RetinaNet

Research Experience in Academic Institutions

June-2022- December, 2022
(6 Month) **Senior Post-Doc Researcher**, *Bioinformatics Institute (BII)*, Agency for Science, Technology and Research (A*STAR) , Singapore

Subject #1 : Analysis of H & E images for the analysis of cancer

Multiple instance learning (MIL) has been increasingly used in the classification of histopathology whole slide images (WSIs). WSIs have very high resolutions and usually lack localized annotations. WSI classification can be cast as a multiple instance learning (MIL) problem when only slide-level labels are available. We propose a MIL-based method for WSI classification and tumor detection that does not require localized annotations.

Subject #2 : Classification of Anti-microbial peptides

Antimicrobial peptides (AMPs) are considered as promising alternatives to conventional antibiotics in order to overcome the growing problems of antibiotic resistance. Computational prediction approaches receive an increasing interest to identify and design the best candidate AMPs prior to the in vitro tests. Here, we are working on **Transformer** based model for the classifications of peptides, showing antimicrobial activity against Gram-negative and against Gram-positive bacteria separately.

Keywords : Multi-Instance Learning, Transformer Network, Whole Slide Image, CNN,

Oct-2020- April-2022
(1 yr 6 months) **Researcher**, *Department of Signal and Communications*, École Nationale Supérieure Mines-Télécom Atlantique Bretagne, France

Subject : Automatic Generation of Under Water Depth Images

Underwater images suffer from color distortion and low contrast, because light is attenuated as it propagates through water. The attenuation varies with wavelength and depends both on the properties of the water body in which the image was taken and the 3D structure of the scene. I am currently working with generative models to artificially generate the underwater images by using depth mapped RGB images, captured by Microsoft Kinect cameras.

Keywords : Image Dehazing, Image Filtering, Deep Neural Networks, ResNet, DenseNet

Collaboration with the companies :

— Cervaal : <https://www.cervval.com/>

— France-Energies-Marines : <https://www.france-energies-marines.org/en/>

Feb-2019- May-2020
(1 yr 4 months) **Research Engineer**, ZENITH, INRIA, France

Subject : Fast kNN All-Pairs-Similarity Search on Uni-dimensional and Multi-dimensional Time Series data

Working in the domain time series analysis. The task is to quickly process huge data sets of time series signals and to perform fast similarity search to quickly calculate the nearest sub-sequence/patterns and the outliers with respect to a given query sequence/pattern (for single and multi dimensional data))

Keywords : Time Series Analysis, Pattern Matching, Motifs and Discord Discovery, kNN Search, Clustering

Collaboration with the company : ["Signal & Data Analytics Lab"](#), Safran-Tech / Pôle TSI, Safran-Group

May-2017- **Post-Doc Researcher**, *L3i*, University of La Rochelle, France

Jan-2019 **Subject** : Analysis of University Diploma Images to Tackle Piracy

(1 yr 9 months) Worked in the domain of document security and fraud detection (document watermarking, font recognition, font generation using Deep Generative Models, evaluation of key-points detectors, graphics and signature detection & recognition)

Keywords : Feature Extraction, Pattern Matching, Deep Generative Models, Key-point Detectors & Descriptors

Collaboration with the company : SOOD : <http://www.sood.fr/fr/home.html>

July-2016 - **Research Engineer**, *LIRIS*, Institut National des Sciences Appliquées de Lyon , France

Jan-2017 **Subject** : Detection and Recognition of "Data-Matrix" (similar to the QR code)
(7 Months)

Worked on data-matrix (similar as QR-Code, imprinted on glass bottles) detection and recognition. The objective was to propose a light weight algorithm for building a mobile application. This application can be used by lab technicians to decode the information from the imprinted QR code like patterns.

Keywords : Feature Extraction, Filtering and Pattern Matching

Jan-2016 - **Founded Startup**, *ArrayTree Pvt. Limited*, mentored by "StartInBox" incubator, Tours, France
June-2016

(6 Months) *GoScanDoc (iOS App)* : A mobile phone based document scanner. Several image pre-processing modules are implemented along with the UI and general document image capturing features are also implemented.

CtNod (Website and Android App) : A web based service along with android application is built for Multi-modal (all public transport e.g. bus, metro etc.) Itinerary application for Kolkata, India.

FixGoNow (Website, Android & iOS App) : A web based and mobile based application (Android, iOS) is built for easy and user friendly system to conveniently book and obtain various services e.g. plumbing, appliance repairs etc. for Kolkata, India.

Nov-2012 - **Worked as PhD student**, *LIFAT*, University of Tours, France

Dec.-2015 **Subject** : From Time Series Signal Matching to Word Spotting in Multilingual Historical Document Images

(3 yrs 1 month) This work deals with dynamic programming based sequence matching techniques, applied to the detection of words (searching for keywords in document images without interpretation of the content). We begin with a comparative study of several dynamic programming based sequence matching techniques for spotting words across multiple datasets of historical images. After having analyzed these various approaches, we then propose a new algorithm, called "Flexible Sequence Matching (FSM)", which combines most of the advantages offered separately by several other sequence matching algorithms. We then also extended FSM to provide another algorithm, named ESC ("Exemplary Sequence Cardinality"), allowing to overcome the weaknesses / inadequacies of FSM.

Keywords : Time series, Sequence matching, Dynamic Time Warping (DTW), image keyword search (Word Spotting), Sub-sequence matching.

Collaboration with the Lab : ["Centre d'études supérieures de la Renaissance \(CESR\)"](#), Tours, France

– Research Experience in Companies and Public Laboratories

Avril-2012 - **Technical Lead**, *Computer Vision Group*, *iGATE (Capgemini Enterprises)*, Pune, India

Oct.-2012 **Subject** : Person Detection in Containers (or Hatch)
(6 Months)

On the mining site (coal, iron mines, etc.), large containers (eg 20m *times* 20m) are used to transport mining materials. It may happen sometimes that there is some person left inside these containers. We have proposed algorithms to automatically detect the presence (during day or night) of any person (using thermal images).

Keywords : Person Detection, Thermal Images, SVM, Feature Extraction

June-2011 - **Imaging Scientist**, *Oxyent-Medical Pvt. Ltd.*, Mumbai, India

March-2012 **Subject** : Segmentation of Kupffer Cells and Cell's Nucleus in Histological Liver Images

(10
Months)

For the purpose of diagnosis and characterization of liver, clinical pathologist uses many features e.g. kupffer cells and cell's nuclei which are the critical and important parameters of liver cells tissue images. In this work, we have proposed an approach for automatic identification of kupffer cells and cell's nuclei from H&E stained histopathology imagery of liver tissue.

Keywords : H&E stained images, histopathology, image segmentation, medical image analysis, nuclei segmentation, object refinement, boundary correction, artifacts removal, microscopic cellular images, color processing, pattern matching

June-2010 - **Project Engineer**, *GIST*, Center for Development of Advanced Computing (CDAC), Pune, India

June-2011 **Subject #1** : Automatic Finger Print Recognition

(1 yr)

Worked on fingerprint recognition system which is one of the most popular biometric techniques, used in automatic personal identification and verification. We have worked on algorithms, based on ridge based techniques for the automatic recognition of fingerprints.

Subject #2 : Dewarping of Document Images

Also worked on dewarping of document images. In general, the traditional OCR systems are designed for planar (de-warped) images and the accuracy is reduced when applied on warped images. Hence, dewarping of document images are highly needed for better OCR results.

Keywords : Optical Character Recognition, Document Image Processing, Document Binarization, Image Segmentation, Feature Extraction and Matching, Image Filtering, Active Contour Models.

Aug-2008 - **Research Fellow**, *CI*, Central Scientific Instruments Org. (CSIR), Chandigarh, India

June-2010 **Subject** : Automatic Craniofacial Structures and Landmark Detection on Cephalometric Images

(1 yr 10
months)

Worked on lateral radiographic x-rays images of head (called cephalograms) which are needed to perform geometric analyses for the planning of appropriate treatment.

Keywords : Radiographic Image, Image Segmentation, Template Matching, Image Filtering, Active Shape Model, Active Appearance Model

Obtained Qualifications (for Assistant Prof. in France)

Number of **20261330223**

qualification Section : 61-Génie informatique, automatique et traitement du signal

Number of **20227330223**

qualification Section : 27-Informatique

Software Developed

kNN-Matrix-Profile

This software is designed to compute the kNN "Matrix Profile" for one-dimensional and multi-dimensional time series data. For more details, visit : <https://github.com/tanmayGIT/kNN-Matrix-Profile.git>

Quick-Matrix-Profile

In this software, we have proposed 3 very fast algorithms to calculate the "Matrix Profile" of one-dimensional data by using classical euclidean distance. For more details, visit : <https://github.com/tanmayGIT/Quick-Matrix-Profile.git>

DocProc

This is the software, which contains several pre-preprocessing and post-processing algorithms for the analysis of document images. For more details, visit : <https://github.com/tanmayGIT/DocProc.git>

Smart-DP

It is a software contains two special algorithms based on dynamic programming for intelligent calculation of the distances between two noisy time series. For more details, visit : <https://github.com/tanmayGIT/Smart-DP.git>

DP-Dist

This software contains several algorithms (almost 32) based on dynamic programming to calculate the distance between two signals or time series. For more details, visit : <https://github.com/tanmayGIT/DP-Dist.git>

Software Proficiency

Languages C/C++, JAVA, Objective-C

Sc.Languages Matlab, Python
IDE C-Lion, X-Code, Code : :Blocks, Eclipse, PyCharm, Visual Studio
Lib OpenCV, ImageJ, OpenMP, PyTorch
OS Ubuntu, Macintosh, Windows
Mobile Tech. iOS

Principal Subjects Studied During Academics

- 2007–2009 **Masters of Technology in Mechatronics & Robotics**, *Indian Institute of Engineering Science and Technology (IIST)*, Shibpur, West Bengal, India
- i) Intelligent Materials, Sensors and Actuators
 - ii) Advanced Microprocessors and Microcontrollers
 - iii) Signal Processing
 - iv) Image Processing
 - v) Robotics
- 2003–2007 **Bachelors of Technology in Computer Science**, *West Bengal University of Technology*, West Bengal, *India*
- i) Operating Systems
 - ii) Microprocessors and Microcontrollers
 - iii) Formal Languages and Theory of Automata
 - iv) Data Structures and Algorithms
 - v) Probability & Statistics and Linear Algebra
 - vi) Software Engineering and Project Management
 - vii) Operational Research and Optimization Techniques
 - viii) Distributed Computing
 - ix) Data Compression and Cryptography
 - x) Web Technology

Teaching

- 2019 Computer Architecture and Operating Systems
2018 Qt and C# programming
2018 Java Persistence API
2017 - 2018 C/C++, Objective-C, iOS programming

Awards

- 2012 IFCPAR, PhD Scholarship for doing PhD at Tours, France
2011 Outstanding Team Award, iGATE (Capgemini Enterprises)
2010 CSIR Foreign Travel Grant, India
2008 Central Scientific and Industrial Research - JRF (GATE) fellowship, India
2007 Ministry of Human Resource Development, India, (GATE) fellowship, India

Services

Journal Reviewer

- 5) IEEE Access
- 4) Pattern Recognition (Elsevier)
- 3) SPIE Journal
- 2) Journal of Visual Communication and Image Representation (Elsevier)
- 1) Information Systems (Elsevier)

International Conference Reviewer

- 6) Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD), 2020, (sub-reviewer)
- 5) International Conference of Data Mining (ICDM), 2019, (sub-reviewer)
- 4) International Conference of Handwriting Recognition (ICFHR), 2018, (sub-reviewer)

- 3) International Conference of Document Analysis and Recognition (ICDAR), 2015, (sub-reviewer)
- 2) Asian Conference of Pattern Recognition (ACPR), 2015, (sub-reviewer)
- 1) International Conference of Advances in Computing, Communication and Control (ICAC3), 2011

Selected Presentation

- 6) Efficient technique for Binarization, Noise Cleaning and Convolutional Neural Network Based Writer Identification for Papyri Manuscripts, 24 Jan, 2020 , Neo-Paleography : Analysing Ancient Handwritings in the Digital Age , University of Basel, Switzerland, [Contents](#)
- 5) From Time Series Matching to Word Image Matching, 24 Nov, 2018 , Department of Ancient History, University of Basel, Switzerland. [Contents](#)
- 4) Logo Localization of Administrative Documents, 16 March, 2018 , L3i, University of La Rochelle, France. [Contents](#)
- 3) Deep Learning Seminar-2018, 17 May , L3i, University of La Rochelle, France. [Contents](#)
- 2) Deep Learning Seminar-2018, 10 July , L3i, University of La Rochelle, France. [Contents](#)
- 1) From Time Series Signal Matching to Word Spotting in Multilingual Historical Document Images, 17 May, 2017 , L3i, University of La Rochelle, France. [Contents](#)

Conference and/or Workshop Organization

- 1) IAPR International Workshop on Document Analysis Systems ([DAS](#)) , 2014, Tours, France
- 2) [Deep Learning Seminar-2018](#) , La Rochelle, France, [click here for the contents](#)

Supervision

Masters Project LE Thi Thuy Trang, "Performance evaluation of deep generative models for generating handwritten character images", University of la Rochelle, France

Miscellaneous

Languages English, French, Hindi, Bangla
 Activities Dance, Football, Badminton, Going to Gym
 D.O.B 1st March, 1986 (36 Years)

References

- 1) [Jean-Yves Ramel](#), Director of Laboratory LIFAT, PolyTech, Ecole Polytechnique de l'Université de Tours (EPU), France
- 2) [Florent Maseglia](#), Director of research, Zenith Team, INRIA Montpellier, France
- 3) [Reza Akbarania](#), Research Scientist, Zenith Team, INRIA Montpellier, France
- 4) [Mickaël Coustaty](#), Associate Prof. at L3i Laboratory, University of La Rochelle, France
- 5) [Nicolas Ragot](#), Associate Prof. and Team Lead of RFAI, LIFAT Laboratory, Ecole Polytechnique de l'Université de Tours (EPU), France
- 6) [Umapada Pal](#), Computer Vision and Pattern Recognition Unit, Indian Statistical Unit, Kolkata, India

Personal Website

<https://mondal-tanmoy.github.io/>

Publications

I have publications in following two themes/topics of research :

1. **Image Processing and Pattern Recognition (IM-PR)**
2. **Time Series Analysis and Data Mining (TSA-DM)**

Hence I have categorized the following list of publications into these two categories

1.1 Articles of International Journals

6. Musab Al-Ghadi, **Tanmoy Mondal**, Zuheng Ming, Petra Gomez-Krämer, Mickaël Coustaty, Nicolas Sidere, Jean-Christophe Burie; “Identifying Fraudulent Identity Documents by Analyzing Imprinted Guilloche Patterns”; **accepted** in Springer Multimedia Tools and Applications Journal ; **(Impact Factor : 3.6) (IM-PR)**
5. **Tanmoy Mondal**, Reza Akbarinia, Florent Masegla; “Matrix Profile Based kNN Search over Large Time Series”; “Springer Data Mining and Knowledge Discovery (DMKD)” Journal; **(Impact Factor : 5.40) (TSA-DM)**
4. **Tanmoy Mondal**, Abhijit Das, Zuheng Ming; “Exploring Multi-Tasking Learning in Document Attribute Classification”; Elsevier Pattern Recognition Letters (PRL) Journal; **(Impact Factor : 3.75) (IM-PR)**
3. **Tanmoy Mondal**, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “Comparative Study of Conventional Time Series Matching Techniques for Word Spotting”; Elsevier Pattern Recognition (PR) 73: 47-64, 2018 **(Impact Factor : 7.74) (IM-PR & TSA-DM)**
2. **Tanmoy Mondal**, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “Flexible Sequence Matching Technique: An Effective Learning-Free Approach for word-spotting”; Elsevier Pattern Recognition (PR) 60: 596-612, 2016 **(Impact Factor : 7.74) (IM-PR & TSA-DM)**
1. **Tanmoy Mondal**, Ashish Jain, H.K Sardana; “Craniofacial Structure Detection on Cephalometric Images”; IEEE Transactions on Image Processing (TIP), Vol. PP, Issue. 99ISSN. 1057-7149, 2011 **(Impact Factor : 10.85) (IM-PR)**

1.1.1 Under Review

1. Himanshu Srivastava, **Tanmoy Mondal**, Mickaël Coustaty, Umapada Pal; “Multi-task Learning for the Classification of Papyrus Manuscripts and Symbols”; submitted in Elsevier Pattern Recognition Letters (PRL) Journal; **(Impact Factor : 3.75) (IM-PR)**

1.1.2 Ongoing Work on Journal Drafts

1. **Tanmoy Mondal**, Reza Akbarinia, Florent Maseglia; “Efficient Matrix Profile Algorithms for Knowledge Discovery from Time Series”; will be submitted in “Springer Data Mining and Knowledge Discovery (DMKD)” Journal; **(Impact Factor : 5.40) (Probable submission date : April, 2024) (TSA-DM)**

1.2 Publication in International Conferences

- **CORE Rank A* : Taux d’acceptation 4%**
- **CORE Rank A : Taux d’acceptation 14%**
- **CORE Rank B : Taux d’acceptation 26%**

1.2.1 Published

13. **Tanmoy Mondal**, Mickaël Coustaty, Petra Gomez-Krämer, Jean-Marc Ogier; “Background Removal of French University Diplomas”; Document Analysis Systems. DAS 2020. vol 12116.; **(CORE Rank : B) (IM-PR)**
12. Ioannis Pratikakis, Konstantinos Zagoris, Xenofon Karagiannis, Lazaros Tsochatzidis, **Tanmoy Mondal**, Isabelle Marthot-Santaniello; “ICDAR 2019 Competition on Document Image Binarization (DIBCO 2019)”; ICDAR 2019 **(CORE Rank : A) (IM-PR)**
11. **Tanmoy Mondal**, Mickaël Coustaty, Petra Gomez-Krämer, Jean-Marc Ogier; “Learning Free Document Image Binarization Based on Fast Fuzzy C-Means Clustering”; ICDAR; 2019; **(CORE Rank : A) (IM-PR)**
10. **Tanmoy Mondal**, Mickaël Coustaty; “Constrained and Parametric Dynamic Programming for Word Image Retrieval”; ICFHR; 2018, 327-332; **(CORE Rank : B) (IM-PR & TSA-DM)**
9. Frederic Rayar, **Tanmoy Mondal**, Sabine Barrat, Fatma Bouali, and Gilles Venturini; “Visual Analysis System for Features and Distances Qualitative Assessment: Application to Word Image Matching”; DAS; 2016: 381-386; **(CORE Rank : B) (IM-PR)**
8. **Tanmoy Mondal**, A. Tarafdar, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “Improved Shape Code Based Word Matching for Multi-script Documents”; ACPR 2015 : 1141-1145 **(IM-PR)**
7. **Tanmoy Mondal**, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “Performance evaluation of DTW and its variants for word spotting in degraded documents”; ICDAR 2015 : 1141-1145; **(CORE Rank : A) (IM-PR & TSA-DM)**

6. **Tanmoy Mondal**, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “Exemplary Sequence Cardinality: An effective application for word spotting”. ICDAR 2015 : 1146-1150; **(CORE Rank : A)**
(IM-PR & TSA-DM)
5. **Tanmoy Mondal**, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “Flexible Sequence Matching Technique: Application to Word Spotting in Degraded Documents”; ICFHR 2014: 210-215; **(CORE Rank : B)** **(IM-PR & TSA-DM)**
4. **Tanmoy Mondal**, Nicolas Ragot, Jean-Yves Ramel, Umapada Pal; “A Fast Word Retrieval Technique Based on Kernelized Locality Sensitive Hashing”; ICDAR 2013 : 1195-1199 **(CORE Rank : A)**
(IM-PR)
3. **Tanmoy Mondal**, G. Mourya; “An Accelerated Approach of Template Matching for Rotation, Scale and Illumination Invariance”; Springer Link Proc.; Communications in Computer and Information Science; vol.142, issue.2, 2011. **(IM-PR)**
2. **Tanmoy Mondal**, Ashish Jain, H.K Sardana; “Generation Algorithm of Craniofacial Structure Contour in Cephalometric Image”; Proc. SPIE, ICDIP, Vol.7546; Feb. 2010. **(IM-PR)**
1. Ashish Jain, **Tanmoy Mondal**, H.K Sardana; “A novel strategy for automatic localization of cephalometric landmarks”; IEEE Proc. International Conference on Computer Engg. & Tech., V3:284 - V3:288; June, 2010. **(IM-PR)**