INSA Rennes recruits
a Post-doctoral researcher / Research engineer in computer science

Combining Deep and Syntactical Models for a Self-adaptive Optical Music Recognition System applied on Historical Orchestra Scores

IRISA - Intuidoc

IRISA is a joint research center for Informatics, including Robotics and Image and Signal Processing. 850 people, 40 teams, explore the world of digital sciences to find applications in healthcare, ecology-environment, cyber-security, transportation, multimedia, and industry... INSA Rennes is one of the 8 trustees of IRISA.

The Intuidoc team (https://www.irisa.fr/intuidoc) conducts researches on the topic of document image recognition. Since many years, the team proposes a system, called DMOS-PI method, for document structure analysis of documents. This DMOS-PI method is used for document recognition, or field extraction in archive documents, handwritten contents damaged documents (musical scores, archives, newspapers, letters, electronic schema, …).

Collabscore project

Collabscore is a project founded by ANR (French Research National Agency), led by the CNAM. The goal is to study ancient scores provided by the BNF (Bibliothèque National de France) and Royaumont foundation. Collabscore is a multidisciplinary project. The first task consists in improving OMR (Optical Music Recognition) results using learning techniques. The second action will focus on methods for automatic alignment of the scored score with other multimodal sources. The last one will set up demonstrators based on notated scores at two of the project partners, representative, in various ways, of institutions in charge of musical heritage collections (BnF and Fondation Royaumont). Intuidoc team focuses on the first task of musical score recognition.

Position to be filled

Position: Post-doctoral fellow / Research engineer
Time commitment: Full-time
Duration of the contract: Up to 32 months (December 1st, 2021 (or later) – July 31st, 2024)
Supervisors: Bertrand Coüasnon, Aurélie Lemaitre, Yann Soullard
Indicative salary: Up to €36 000 gross annual salary (according to experience),
             with social security benefits
Location: IRISA – Rennes

Missions

The post-doctoral/engineer fellow will work on the conception of an OMR system. Based on previous works of our research team [Coüasnon & Lemaitre 2017, Pacha et al. 2018], the goal of this position is

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to enrich an existing system (DMOS-PI) to get a complete self-adaptative OMR system for historical orchestra scores. The tasks are mainly:

- define a grammatical description of musical notation, using the existing DMOS-PI method;
- generate unsupervised data for training musical symbols recognizers, using the Isolating-GAN, a novel unsupervised music symbol detection method based on Generative Adversarial Network (GAN);
- create a gradual mechanism for adapting the system to new partitions to build a self-adaptive system with few annotated data;
- integrate anomaly detection into the system.

Logical programming from grammars and languages is expected in this work. Machine Learning methods, especially Deep learning-based approaches (GAN, RCNN, SSD...), will be used to solve some of the tasks, as done in our previous works on music symbol detection [Choi et al. 2019, Choi et al. 2018].

Main Skills

- PhD in computer science or Master degree
- Experience in document recognition or statistical analysis.
- Skills in grammars and languages and/or logical programming are nice-to-have, as well as knowledge of music notation.
- Knowledge in deep learning with an experience with at least one library dedicated to deep learning (Keras, Tensorflow, Pytorch) are expected.

Candidates should contact via email: bertrand.couasnon@irisa.fr, aurelie.lemaitre@irisa.fr , yann.soullard@irisa.fr

References

[Coüasnon & Lemaitre 2017] Coüasnon, B., & Lemaitre, A. (2017, November). DMOS, It's your turn!. In *1st International Workshop on Open Services and Tools for Document Analysis (ICDAR-OST)*.

[Choi et al. 2019] Choi, K. Y., Coüasnon, B., Ricquebourg, Y., & Zanibbi, R. (2019, September). CNN-Based Accidental Detection in Dense Printed Piano Scores. In *2019 International Conference on Document Analysis and Recognition (ICDAR)* (pp. 473-480). IEEE.

[Choi et al. 2018] Choi, K. Y., Coüasnon, B., Ricquebourg, Y., & Zanibbi, R. (2018, September). Music Symbol Detection with Faster R-CNN Using Synthetic Annotations. In *1st International Workshop on Reading Music Systems*.

[Pacha et al. 2018] Pacha, A., Choi, K. Y., Coüasnon, B., Ricquebourg, Y., Zanibbi, R., & Eidenberger, H. (2018, April). Handwritten music object detection: Open issues and baseline results. In *2018 13th IAPR International Workshop on Document Analysis Systems (DAS)* (pp. 163-168). IEEE.