**Individual Project Registration**

**ENGN4200**

**Note:** this form must be completed with a text editor (font 11 pt, Arial) by the student and signed by the student, the supervisor and the secondary supervisor/examiner.

**STUDENT**

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| --- | --- |
| Surname: | Ignetik |
| First name: | Oliver |
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| Contact phone #: | 0479132542 |
| Enrolled units: | ENGN 4200, ENGN 3230 |

**SUPERVISER**

|  |  |
| --- | --- |
| Surname: | Sadeghi |
| First name: | Parastoo |
| Uni ID or “External”: | u4267276 |
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| Contact phone #: | N/A |

**SECONDARY SUPERVISER/EXAMINER**

|  |  |
| --- | --- |
| Surname: |  |
| First name: |  |
| Uni ID or “External”: |  |
| Email address: |  |
| Contact phone #: |  |

**PROJECT (Maximum two pages)**

Please clearly identify your project context, specific research question, the scope of your project and key elements of previous work. It is important to be able to articulate the specific research question being posed to ensure further research and effort are leading to answering that question.

1. **Title**

Polyphonic Automatic Music Transcription (AMT)

1. **Research question:**

Is it possible to improve AMT methods by incorporating long range dependencies in note interactions?

1. **Background context/ Initial scope of project:**

AMT is a fundamental problem in the field of music signal processing with applications ranging from improving perception of music amongst cochlear implant users to educational usage in developing aural transcription skills. AMT provides the main link between music signal processing and symbolic music processing.

The initial scope of this project will be based around exploring improving the performance of AMT methods in a polyphonic/ multi-instrument environment at an audio signal to musical notation level. This project will only consider pitched instruments and Western music and the assumptions made on scales and standard tuning frequency.

AMT has close relations with speech processing as both tasks involve converting acoustic signals to symbolic sequences the difference being that musical sources are highly correlated in time and frequency. This being the case there are a number of key challenges in the field which include: complex mixture signals with a significant harmonic overlap, sources cannot be statistically independent due to the synchronization of onsets and onsets between different sources and the lack of large universally verified datasets containing ground truth transcriptions.

There are several commercial AMT software on the market such as Melodyne, AudioScore and Transcribe! However, these systems underperform in polyphonic environments and the conversion of the MIDI files to musical notation is unsatisfactory amongst musicians. Most approaches in AMT are designed to reach an intermediate goal in audio-music notation transcription that does not actually resemble musical notation. These methods work on different levels on transcription ranging from frame estimation of pitches, note estimation, stream/instrument estimation and finally notation level transcription, which most closely resembles the end goal of AMT.

There are two algorithms that dominate the field, that are based around Nonnegative Matrix Factorization (NMF) and the other around Neural Networks (NN). The research has not agreed upon a single approach as each outperform one another in certain scenarios. For example, some limitations of NMF models include the a dependence of linear interpolation for representing unexpected pitches. On the otherhand NNs require large datasets which don’t even exist for some obscure instruments.

However, in recent times NMF models are being increasingly replaced by NN based methods.

There are multiple opportunities in this field for future work to improve the performance of current methods. Of interest to the author the performance of AMT systems in polyphonic environments still has many problems due to the complex nature of the mixture signals and high degree of correlation amongst the sources. Furthermore, there has been some research into the score-informed transcription

1. **Deliverables**

* Conference Paper

1. **Key references**

* E. Benetos, S. Dixon, Z. Duan, S. Ewert, “Automatic Music Transcription”, in IEEE SPS Journal Vol. 36 January
* E. Benetos, S. Dixon, D. Giannoulis, H. Kirchhoff, and A. Klapuri, “Automatic music transcription: Challenges and future directions,” J. Intelligent Inform. Syst.,vol. 41, no. 3, pp. 407–434, 2013.
* International Society of Music Information Retrieval (ISMIR)
* Multiple Fundamental Frequency Estimation and Tracking Task (MIREX)

1. **Micro-grant application (optional)**

RESPONSIBILITIES

**STUDENT**

* Must adhere to the deliverable deadlines set out in this agreement
* Must comply with the University’s policies and procedures in terms of applying for assessment item/deliverable extensions and/or deferred assessments.
* Must attend all scheduled meetings with your Primary and/or Secondary Supervisor, as per your written agreement. If you are unable to attend a scheduled meeting, you will (where practicable) provide your supervisor with prior notice of your unavailability to attend.
* Must understand and exercise the Academic Integrity requirements of the ANU.
* Must provide regular feedback on your progress to your Primary Supervisor and report any challenges which could impact your ability to successfully complete your project (e.g. Health concern).
* Must report any concerns which could be considered significant (e.g. harassment/bullying, Primary Supervisor becomes unresponsive) directly to the Course Convener.

**PRIMARY SUPERVISOR**

* Have a duty of care to the student and must ensure projects are scoped appropriately.
* Must establish regular (weekly or fortnightly) progress meetings with your student, which are agreed in writing (email is sufficient).
* Must maintain regular contact with the student. If a student under your supervision is unresponsive and/or does not attend 2 scheduled meetings in a row without prior explanation, the Supervisor must:
  + Notify the student in writing that they are at risk of breaching their Individual Project Study Contact agreement and provide a deadline for response; and
  + Contact the Course Convener and CECS Student Services so a record can be made.
* Must provide regular feedback, assistance and guidance to students and ensure that the student has access to resources required to complete their project.
* Must advise the student, the Secondary Supervisor and the Course Convener immediately if you are unable to continue supervision and/or if you plan travel for longer than 2 weeks and/or which could reasonably be expected to impact on your ability to supervise the student.
* Must collate all feedback and assessment marks for project deliverables from the Secondary Supervisor and provide final assessment marks to the Course Convener in accordance with CECS result approval deadlines.
* Must communicate any known issues or concerns relating to the student’s progress or welfare to the Course Convener.
* Must attend the poster presentation
* Nominate the second supervisor / examiner – can be in discussion with student.

**SECONDARY SUPERVISOR/ EXAMINER**

* Have a duty of care to the student
* Must liaise regularly with the Primary Supervisor regarding feedback of project deliverables and marking of assessment items.
* Must submit all assessment marks and feedback to the Primary Supervisor in accordance with CECS result approval deadlines.
* Must advise the student and the primary supervisor immediately if you are unable to continue in your role as secondary supervisor and/or if you planning travel for longer than 2 weeks and/or which could reasonably be expected to impact on your ability to supervise the student and/or provide assessment marks.
* Must report any concerns which could be considered significant (e.g. harassment/bullying, primary supervisor becomes unresponsive) in relation to the student and/or their supervision directly to the course convener.

DECLARATIONS

STUDENT

1. I certify that the information I have given in this contract is complete, accurate and truthful.
2. I have read and understood the obligations that apply to me as the student, as well as the requirements of my supervisors and the course convener.
3. I agree to fulfil the obligations of this contract.

………………………………………………….. ………………………..

Signature Date

PRIMARY SUPERVISOR

1. I certify that the information I have given in this contract is complete, accurate and truthful.
2. I have read and understood the obligations that apply to me as the primary supervisor, as well as the requirements of the student, the secondary supervisor/ examiner and the course convener.
3. I have reviewed the aforementioned student’s academic transcript and assess this student to be suitable to complete the project detailed above.
4. I agree to provide supervision and support to the aforementioned student for the duration of the project.
5. I agree to fulfil the obligations of this contract.

………………………………………………….. ………………………..

Signature Date

SECONDARY SUPERVISOR / EXAMINER

1. I certify that the information I have given in this contract is complete, accurate and truthful.
2. I have read and understood the obligations that apply to me as the secondary supervisor, as well as the requirements of the student, the primary supervisor and the course convener.
3. I have reviewed the aforementioned student’s academic transcript and assess this student to be suitable to complete the project detailed above.
4. I agree to provide secondary supervision and support to the aforementioned student for the duration of the project.
5. I agree to fulfil the obligations of this contract.

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Signature Date