Vocal Emotions Analysis of Parent-Child Conversations for Supporting Children’s Emotional Wellbeing

Highlights
Integration of Experience-centred Design and machine learning methods to enhance parent-child communication with the goal of improving children’s mental health

Designing a usable and useful voice-sensor wearable device Voice Emo

Developing automatic analyses of parent and child vocal emotions

Overview
Voice is a significant carrier of emotions. Effective and efficient recognition of vocal emotions can enhance interpersonal communication and relations. While the work on automatic voice emotion recognition (AVER) has benefitted from the recent advances in machine learning research, the accuracy of AVER needs to be further improved. A promising and meaningful area to which AVER can be applied is real-time emotion analysis of parent-child conversations, which play a critical role in child development.

The main goal of this interdisciplinary PhD project is to develop and validate an application that is aimed to support parents to perceive their children’s vocal emotional signals accurately during parent-child conversations (Figure 1). Parents are thus enabled to provide emotionally-sensitive matched responses to engage children in open and desirable conversations on a range of topics, from everyday experiences to critical issues. Provision of this parenting support will contribute to children’s emotional wellbeing and mental health. The support is to be achieved by tackling two major challenges:

- the development of effective machine learning (ML) models for automatic analysis of vocal emotions of both parent and child;
- the design of a usable and useful voice-sensor wearable device VoiceEmo into which the ML models are integrated to present instantaneous and meaningful vocal emotions analysis results and implications to its users for regulating their emotions and behaviours, when applicable.
With its focus on enhancing children’s wellbeing and mental health, emphasising on developmental rather than therapeutic model, the target group of the project will be typically developing children with VoiceEmo being deployed as a parenting training tool. Nonetheless, it will be intriguing to compare the effect of using VoiceEmo on parent-child conversations in specific institutions or groups with that on those in ordinary naturalistic family settings.

Three main research questions of the project are:

- How to maximise the accuracy and speed of real-time automatic emotion analysis with advanced Machine Learning methods?
- How to provide meaningful and timely recommendations to parents on their emotion regulation?
- How effective is the voice-based intervention in enhancing emotional wellbeing of typically developing children and children as risk (anxiety and depression)?

Methodology, Critical Skills and Training and Development

Methodology:
Year 1-2: To address the lack of emotional corpus on parent-child dialogues (a basic component for ML), the initial phase will focus on collecting such dialogues in a range of naturalistic and lab-based settings where parents and children converse on mundane and sensitive topics. Based on raw data, vocal emotion detection training models with different ML approaches will be developed and optimised.

Year 2-3: To develop a prototype of the voice-sensor wearable device with the participatory design approach, involving parent-child dyads over time. Real-time and offline access to results of voice emotion analysis will be supported. Given the participation of children and the issue of privacy, specific strategies on ethics will be observed, including getting initial consent from gatekeepers (parents/carers) and active consent from each individual child. Safeguarding

Year 3: To evaluate the accuracy of the ML methods with real-life testing data and to validate the effectiveness and acceptance of the prototype for training parents. Field studies in natural settings (e.g. home) and lab-based studies will be carried out.

Skill development and training opportunities:
- State-of-the-art machine learning methods;
- Research methods in Human-Computer Interaction (HCI): Participatory Design, Usability and User Experience evaluation, Multivariate statistical analysis, Qualitative data analysis
- Child psychological development
- Research ethics

Further Reading

**Additional Entry Requirements**

- Master’s degree in Computer Science/Informatics preferable
- Good knowledge in machine learning methods
- Basic knowledge of Human-Computer Interaction, especially interaction design
- Experience of working with children

**Funding**

This research project is one of a number of projects in the College. It is in competition for funding with one or more of these projects. Usually the project which receives the best applicant will be awarded the funding.

**Home/EU Applicants**

This project is eligible for a fully funded EPSRC studentship which includes:

- A full UK/EU fee waiver for 3.5 years
- An annual tax free stipend of £14,777 (2018/19)
- Research Training Support Grant (RTSG)

Studentships are available to UK/EU applicants who meet the EPSRC Residency Criteria; if you have been ordinarily resident in the UK for three years you will normally be entitled to apply for a full studentship.

If you are an EU student and do not meet the residency criteria, please contact csepgr@le.ac.uk for more information on the funding options available.

**International Applicants**

- Unfortunately, there is no funding for international students on this project.

**Application Instructions**

The online application and supporting documents are due by **Monday 21st January 2019**.

Any applications submitted after the deadline will not be accepted for the studentship scheme.

References should arrive no later than **Monday 28th January 2019**.

Applicants are advised to apply well in advance of the deadline, so that we can let you know if anything is missing from your application.

**Required Materials**

1. Online application form
2. Two academic references
3. Transcripts
4. Degree certificate/s (if awarded)
Applications which are not complete by the deadline will not be considered for the studentship scheme. It is the responsibility of the applicant to ensure the application form and documents are received by the relevant deadlines.

All applications must be submitted online, along with the supporting documents as per the instructions on the website.

Please ensure that all email addresses, for yourself and your referees, are correct on the application form.

For more information, please visit our website at:
https://www2.le.ac.uk/colleges/scieng/research/postgraduate-opportunities/epsrc-2019/instructions