Learning to Assess Experience in Physical Spaces

Project Management and Software Development
for Medical Applications

General Info

Project Title:

Learning to Assess Experience with Sensors

Contact Person: Patrick Ruhkamp

Contact Email: p.ruhkamp@3dwe.ai

Project Abstract

The project aims to learn an objective scoring function to validate experience in a physical space such as a lecture room (or clinical) setup. This involves leveraging AI and computer vision to analyse person interactions and interactions. The plan comprises data collection with existing hardware, descriptor learning, GDPR-compliant correlation analysis, A/B testing, documentation, and presentation. The project aims to generate learned descriptors capturing interactions, correlate them with experience scores and compare setups. Existing resources like datasets, self-supervised learning frameworks, AI libraries, and privacy guidelines will be used. The project's results intend to empower end-users to objectively assess experience in physical spaces to gain actionable insights while ensuring GDPR compliance and data privacy.

Collaboration partners: XPAI, 3Dwe

Student's Tasks Description

An advanced analytical system that leverages computer vision (CV) and AI algorithms to decode user interactions captured in video data is designed. The system is based on existing (vision) sensors. By utilizing self-supervised embedding learning techniques, such as SimCLR, contrastive learning, or triplet loss, the project seeks to create a learned descriptor that encapsulates behavioral patterns (e.g., gender, age, time of the day). These descriptors will then be correlated with provided experience scores to uncover underlying patterns. The project also involves extracting quantifiable measures and identifying relationships between different setups (A/B testing). The insights gained will provide valuable information for physical spaces such as lecture rooms, medical practitioners, or the OR to optimize processes while adhering to GDPR compliance and ethical data usage.

An active interaction with XPAI and 3Dwe provides insight into offline marketing and experience quantification using modern computer vision and AI algorithms.

Project Plan:

1. Project Initiation and Data Collection:

- Define project scope and requirements with partners.
- Curate an existing dataset of selected physical spaces with existing hardware. Curate the dataset with experience scores, as well as meta-information like gender, age, and time of the day.

2. Descriptor Learning with AI Algorithms:

- Implement self-supervised embedding learning techniques (SimCLR, contrastive learning, triplet loss) to create a learned descriptor for each interaction.

3. Correlation Analysis & Data Fusion

- Correlate the learned descriptors with the provided experience scores and meta-data to identify relationships and patterns.
- Investigate an A/B testing setup between different varieties of experiences seeking underlying insights.

4. Evaluate GDPR-Compliant Experience Metrics:

- Extract GDPR-compliant quantifiable measures from the data to provide objective descriptions of patterns.
- Visualize present correlations, patterns, and quantifiable metrics.

Please send the completed proposal to tianyu.song@tum.de, shervin.dehghani@tum.de and felix.tristram@tum.de. Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.

5. Documentation and Presentation:

- Create comprehensive documentation detailing algorithms, methodologies, and implementation.
- Transfer knowledge to stakeholders for ongoing maintenance and development.
- Present project outcomes, insights, and benefits to medical practitioners and pharmacies.

Technical Prerequisites

- Python and OpenCV
- PyTorch

References

Ting Chen, Simon Kornblith, Mohammad Norouzi, Geoffrey Hinton. A Simple Framework for Contrastive Learning of Visual Representations. PMLR 119:1597-1607, 2020.

Esch, F R et al. "Brands on the brain: Do consumers use declarative information or experienced emotions to evaluate brands?" Journal of Consumer Psychology 22 (2012): 75-85.