ATHENA: Evaluating users for preoperative risk assessment

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Background/Motivation:

In collaboration with Katrine B. Buggeskov from Rigshospitalet[1], we aim to help doctors focus more on what truly matters: caring for their patients. When a patient requires anesthesia, an anesthesiologist is responsible for administering it correctly and keeping the patient alive during the procedure. However, before they even get to the operating room, every patient must go through a preoperative screening process. This process assesses key factors like the amount of space inside their mouth[3], neck mobility, and other indicators to determine if they are fit for anesthesia [5].

Interestingly, most patients don't face any major issues, making the screening process time-consuming for medical professionals. To address this, we're working on developing an automated system that allows patients to complete their preoperative screening at home using their smartphones. This solution aims to save time, optimize hospital resources, and make the entire process more efficient for both patients and doctors.

But how should this system work? What should it look at to evaluate a patient? And what methods can we leverage to make these evaluations both accurate and explainable?

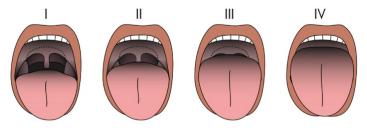


Figure 2.2: The Mallampati score classifications, showing the four classes.

Project:

The goal is to implement a system that can provide clear, explainable decisions on whether a patient is suitable for anesthesia. To do this, students will have to explore and implement computer vision and/or machine learning/deep learning methods to assess patients based on physiological metrics.

Since there's no one-size-fits-all method for pre-operative risk assessment, part of this project can also be to explore and experiment with different metrics to find what works best.

The project is part of a larger research project (ATHENA) consisting of members from both Rigshospitalet and Aalborg University. As part of this initiative, a workshop is planned for March 26, where you can gather input from real patients for your solution. Additionally, anesthesiology

patients will be available in early May to test the solution on the actual target group. Since this project ultimately supports the research initiative, we are open to assisting with publishing your work if it is suitable

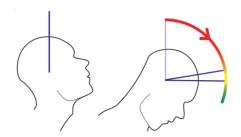


Figure 2.3: Illustration of the user tilting their head as far forward as possible in the neck movement exercise

Research question

How can computer vision and machine learning techniques be utilized to automate preoperative anesthesia risk assessment using smartphone-based patient evaluations?

Relevant Sources

- [1] https://research.regionh.dk/da/persons/katrine-b-buggeskov
- [2] https://vap.aau.dk/
- [3] Mallampati, S. Rao, et al. "A clinical sign to predict difficult tracheal intubation; a prospective study." Canadian Anaesthetists' Society Journal 32 (1985): 429-434.
- [4] Jain, Shreyansh, Prem C. Pandey, and Rajbabu Velmurugan. "Lip contour detection for estimation of mouth opening area." 2015 Fifth National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics (NCVPRIPG). IEEE, 2015.
- [5] Abdel Raouf El-Ganzouri et al. "Preoperative airway assessment: predictive value of a multivariate risk index". In: Anesthesia & Analgesia 82.6 (1996), pp. 1197–1204.
- [6] Wang, Guangzhi et al. "A fully-automatic semi-supervised deep learning model for difficult airway assessment" Heliyon, Volume 9, Issue 5, e15629