## Machine learning for degenerative cervical myelopathy

Degenerative cervical myelopathy (DCM) is a spinal cord condition that results in progressive nontraumatic compression of the cervical spinal cord. Spine surgeons must consider a large quantity of information relating to disease presentation, imaging features, and patient characteristics to determine if a patient will benefit from surgery for DCM.

Merali et al., applied a supervised machine learning approach to develop a classification model to predict individual patient outcome after surgery for DCM. Patients undergoing surgery for DCM as a part of the AOSpine CSM-NA or CSM-I prospective, multicentre studies were included in the analysis. Out of 757 patients 605, 583, and 539 patients had complete follow-up information at 6, 12, and 24 months respectively and were included in the analysis. The primary outcome was improvement in the SF-6D guality of life indicator score by the minimum clinically important difference (MCID). The secondary outcome was improvement in the Modified Japanese Orthopaedic Association scale (mJOA) score by the MCID. Predictor variables reflected information about pre-operative disease severity, disease presentation, patient demographics, and comorbidities. A machine learning approach of feature engineering, data pre-processing, and model optimization was used to create the most accurate predictive model of outcome after surgery for DCM. Following data pre-processing 48, 108, and 101 features were chosen for model training at 6, 12, and 24 months respectively. The best performing predictive model used a random forest structure and had an average area under the curve (AUC) of 0.70, classification accuracy of 77%, and sensitivity of 78% when evaluated on a testing cohort that was not used for model training. Worse pre-operative disease severity, longer duration of DCM symptoms, older age, higher body weight, and current smoking status were associated with worse surgical outcomes.

Merali et al., developed a model that predicted positive surgical outcome for DCM with good accuracy at the individual patient level on an independent testing cohort. The analysis demonstrates the applicability of machine-learning to predictive modeling in spine surgery <sup>1)</sup>.

## 1)

Merali ZG, Witiw CD, Badhiwala JH, Wilson JR, Fehlings MG. Using a machine learning approach to predict outcome after surgery for degenerative cervical myelopathy. PLoS One. 2019 Apr 4;14(4):e0215133. doi: 10.1371/journal.pone.0215133. eCollection 2019. PubMed PMID: 30947300.

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