

Machine learning for degenerative cervical myelopathy

Degenerative cervical myelopathy (DCM) is a **spinal cord** condition that results in progressive non-traumatic 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** quality 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** ¹⁾.

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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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