Sequential Sentence Classification Capstone Project

Objective:

Build a deep learning model for sequential sentence classification to convert "harder to read" text into "easier to read" text.

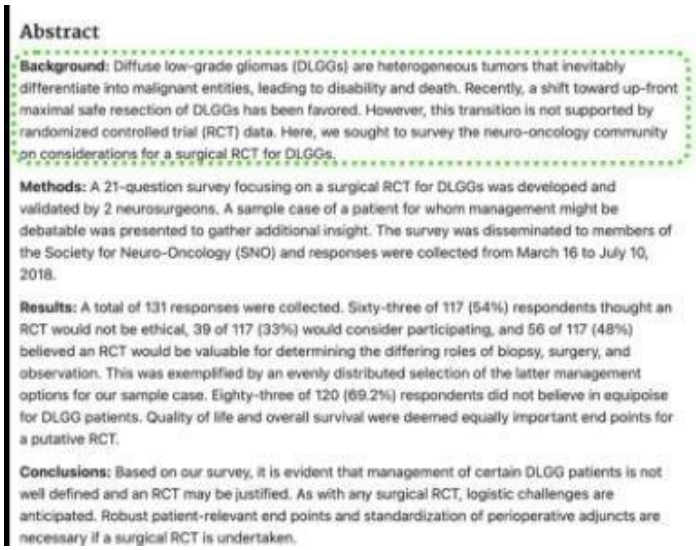
Input:

Abstract

Mental illness, including depression, anxiety and bipolar disorder, accounts for a significant proportion of global disability and poses a substantial social, economic and heath burden. Treatment is presently dominated by pharmacotherapy, such as antidepressants, and psychotherapy, such as cognitive behavioural therapy; however, such treatments avert less than half of the disease burden, suggesting that additional strategies are needed to prevent and treat mental disorders. There are now consistent mechanistic, observational and interventional data to suggest diet quality may be a modifiable risk factor for mental illness. This review provides an overview of the nutritional psychiatry field. It includes a discussion of the neurobiological mechanisms likely modulated by diet, the use of dietary and nutraceutical interventions in mental disorders, and recommendations for further research. Potential biological pathways related to mental disorders include inflammation, oxidative stress, the gut microbiome, epigenetic modifications and neuroplasticity. Consistent epidemiological evidence, particularly for depression, suggests an association between measures of diet quality and mental health, across multiple populations and age groups; these do not appear to be explained by other demographic, lifestyle factors or reverse causality. Our recently published intervention trial provides preliminary clinical evidence that dietary interventions in clinically diagnosed populations are feasible and can provide significant clinical benefit. Furthermore, nutraceuticals including n-3 fatty acids, folate, S-adenosylmethionine, N-acetyl cysteine and probiotics, among others, are promising avenues for future research. Continued research is now required to investigate the efficacy of intervention studies in large cohorts and within clinically relevant populations, particularly in patients with schizophrenia, bipolar and anxiety disorders.

(Figure: Harder to Read Example)

Output:



Abstract

Background: Diffuse low-grade gliomas (DLGGs) are heterogeneous tumors that inevitably differentiate into malignant entities, leading to disability and death. Recently, a shift toward up-front maximal safe resection of DLGGs has been favored. However, this transition is not supported by randomized controlled trial (RCT) data. Here, we sought to survey the neuro-oncology community on considerations for a surgical RCT for DLGGs.

Methods: A 21-question survey focusing on a surgical RCT for DLGGs was developed and validated by 2 neurosurgeons. A sample case of a patient for whom management might be debatable was presented to gather additional insight. The survey was disseminated to members of the Society for Neuro-Oncology (SNO) and responses were collected from March 16 to July 10, 2018.

Results: A total of 131 responses were collected. Sixty-three of 117 (54%) respondents thought an RCT would not be ethical, 39 of 117 (33%) would consider participating, and 56 of 117 (48%) believed an RCT would be valuable for determining the differing roles of biopsy, surgery, and observation. This was exemplified by an evenly distributed selection of the latter management options for our sample case. Eighty-three of 120 (69.2%) respondents did not believe in equipoise for DLGG patients. Quality of life and overall survival were deemed equally important end points for a putative RCT.

Conclusions: Based on our survey, it is evident that management of certain DLGG patients is not well defined and an RCT may be justified. As with any surgical RCT, logistic challenges are anticipated. Robust patient-relevant end points and standardization of perioperative adjuncts are necessary if a surgical RCT is undertaken.

(Figure: Easier to Read Example)

Input:

Investigate the efficacy of several weeks of daily low-dose oral prednisolone in improving pain, mobility, and systemic low-grade inflammation in the short term, and whether the effect is sustained in older adults with moderate to severe knee osteoarthritis (OA). A total of a specified number of patients with primary knee OA were randomized into two groups; one group received a daily dose of prednisolone while the other received a placebo. Outcome measures included pain reduction, improvement in function scores, and systemic inflammation markers. Pain was assessed using the visual analog pain scale. Secondary outcome measures included the Western Ontario and McMaster Universities Osteoarthritis Index scores, patient global assessment of knee OA severity, and walk distance. Serum levels of various biomarkers were measured. There was a clinically relevant reduction in the intervention group compared to the placebo group for knee pain, physical function, and other measures at different time points.

Output:

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OBJECTIVE To investigate the efficacy of several weeks of daily low-dose oral prednisolone in improving pain, mobility, and systemic low-grade inflammation in the short term, and whether the effect is sustained in older adults with moderate to severe knee osteoarthritis (OA).
METHODS A total of a specified number of patients with primary knee OA were randomized into two groups; one group received a daily dose of prednisolone while the other received a placebo.
METHODS Outcome measures included pain reduction and improvement in function scores and systemic inflammation markers.
METHODS Pain was assessed using the visual analog pain scale.
METHODS Secondary outcome measures included the Western Ontario and McMaster Universities Osteoarthritis Index scores, patient global assessment of knee OA severity, and walk distance.
METHODS Serum levels of various biomarkers were measured.
RESULTS There was a clinically relevant reduction in the intervention group compared to the placebo group for knee pain, physical function, and other measures at different time points.
RESULTS Further, there was a clinically relevant reduction in the serum levels of biomarkers at different time points in the intervention group compared to the placebo group.
RESULTS These differences remained significant at various time points.
RESULTS The responder rate was significantly higher in the intervention group compared to the placebo group.
CONCLUSIONS Low-dose oral prednisolone had both a short-term and a longer sustained effect resulting in less knee pain, better physical function, and reduced systemic

inflammation in older patients with knee OA.]

Dataset:

PubMed 20k RCT is a dataset based on PubMed for sequential sentence classification. It consists of approximately 20,000 abstracts of randomized controlled trials, with each sentence labeled with their role in the abstract using one of the following classes: background, objective, method, result, or conclusion. The dataset serves two purposes:
1. Addressing the need for datasets in sequential short-text classification.
2. Providing tools for researchers to efficiently skim through literature by automatically classifying each sentence in an abstract.

Approach:

Develop a many-to-one model.

Experiment:

Model	Description
0	Naïve Bayes with TF-IDF encoder (baseline)
1	Conv1D with token embedding
2	Pretrained Feature Extractor
3	Conv1D with character embedding
4	LLM-based approach (e.g., BERT, GPT)

LLM-based Approach:

Incorporate a large language model (LLM) such as BERT or GPT for sentence classification. This model will leverage pre-trained knowledge and fine-tune on the PubMed 20k RCT dataset for improved accuracy and efficiency in classifying sentences.

Submission:

Submit the following files:
1. Jupyter notebook (both .ipynb and .html formats)
2. PPT containing all inferences and analyses
3. Explanation of slides in audio or video format (if recording is not possible, add slide notes in the PPT or attach a summary text file)
Audience: Present your analysis in a way that is understandable to a business team.