Interim Presentation

Natural Language Processing

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Agenda

Goal

What is the project's goal?

Data Analysis

Interesting insights about texts and labels

NER

Important terms in texts

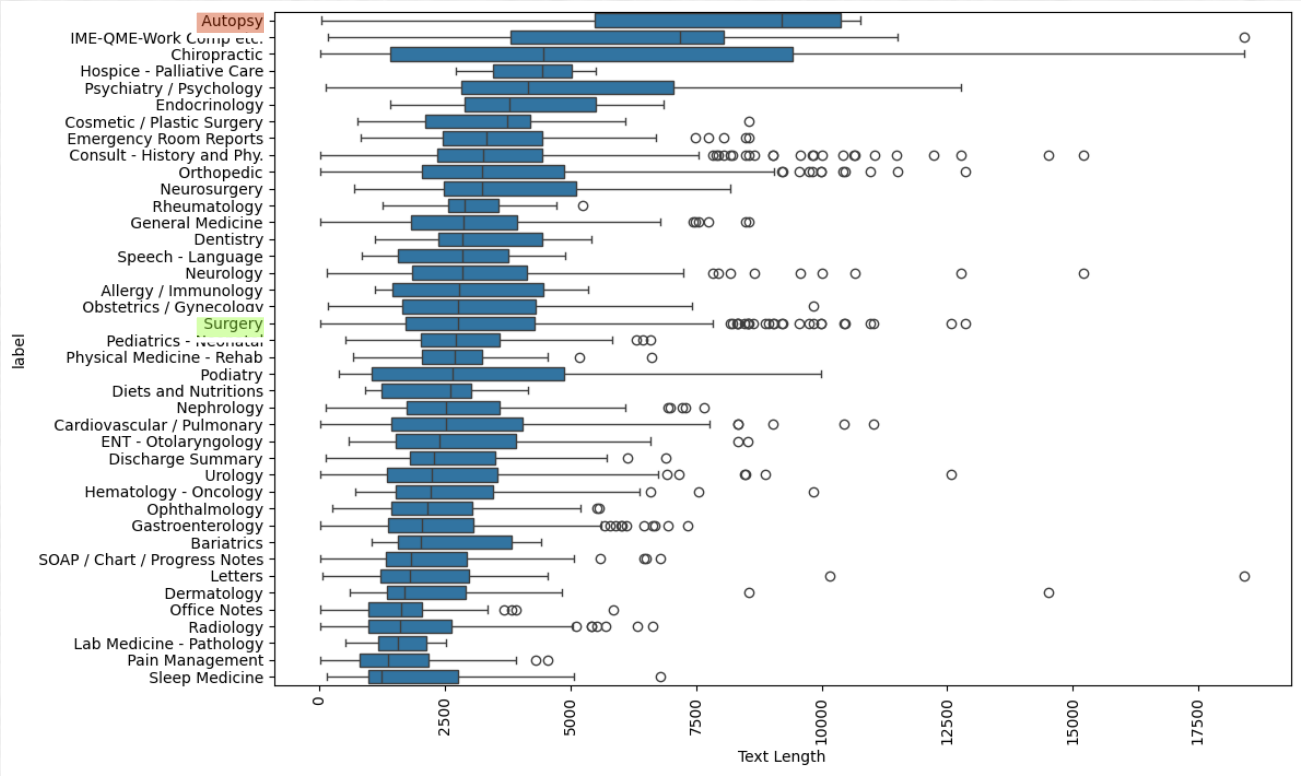
Issues

Difficulties and other challenges

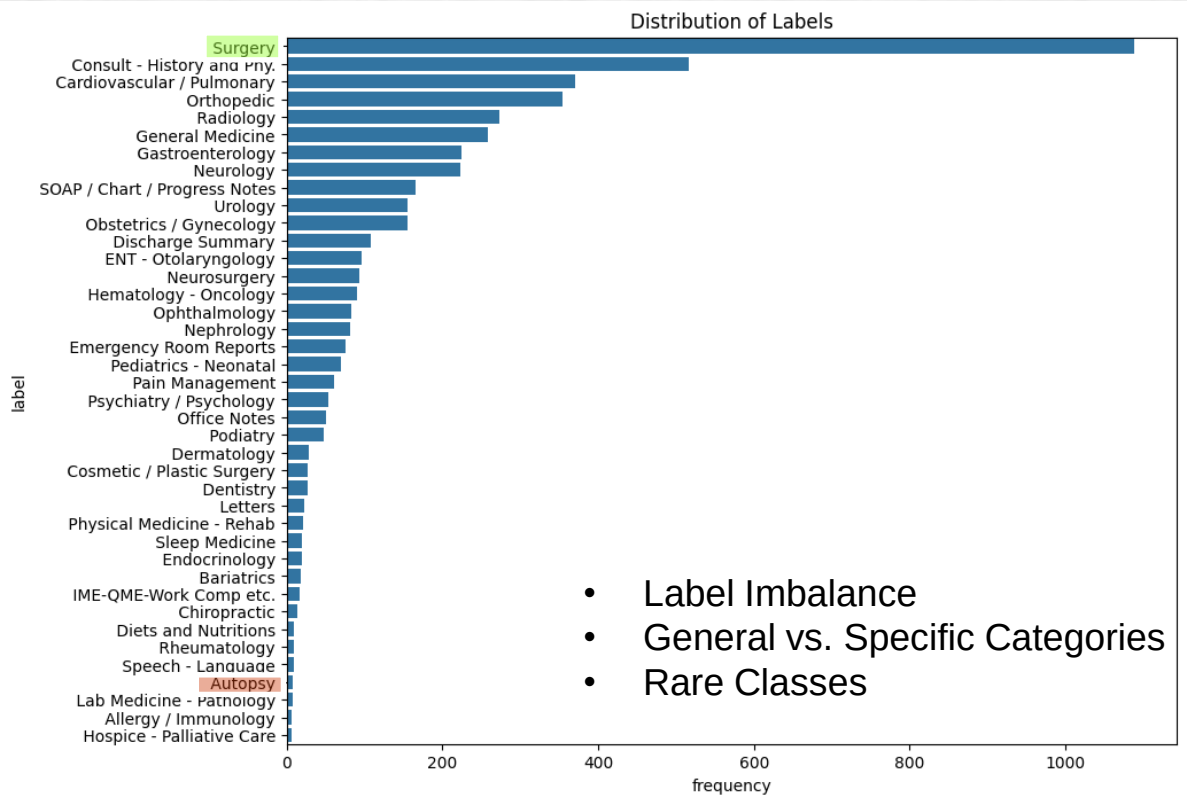
Classification of medical transcriptions into medical specialties.

Project Goal

Text Length Distribution

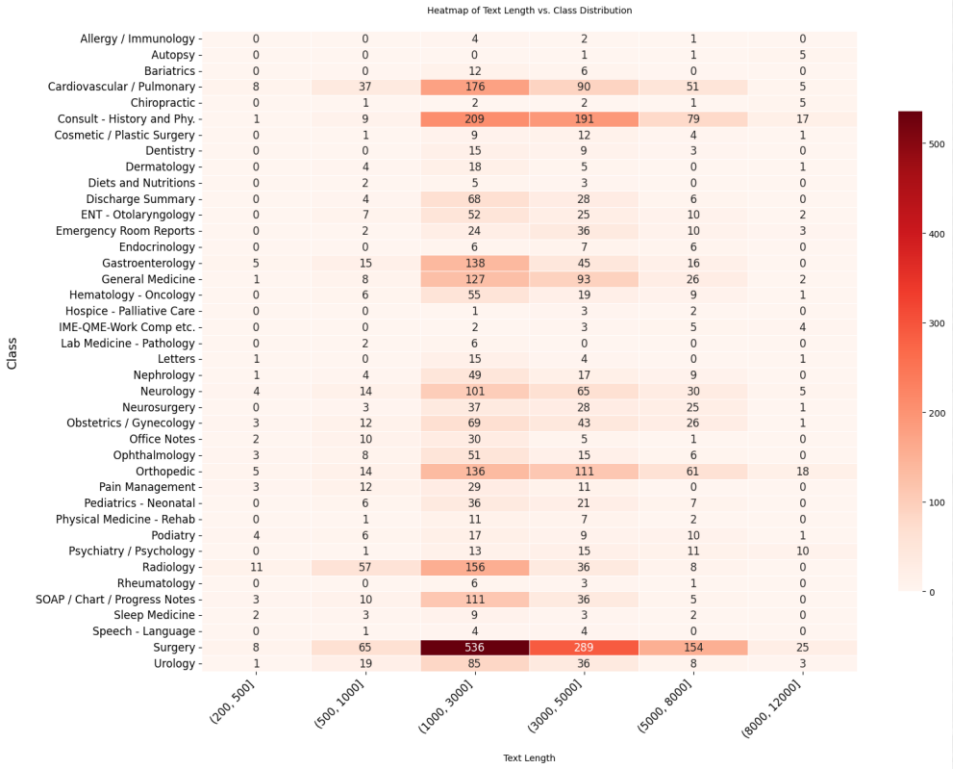


Label Distribution



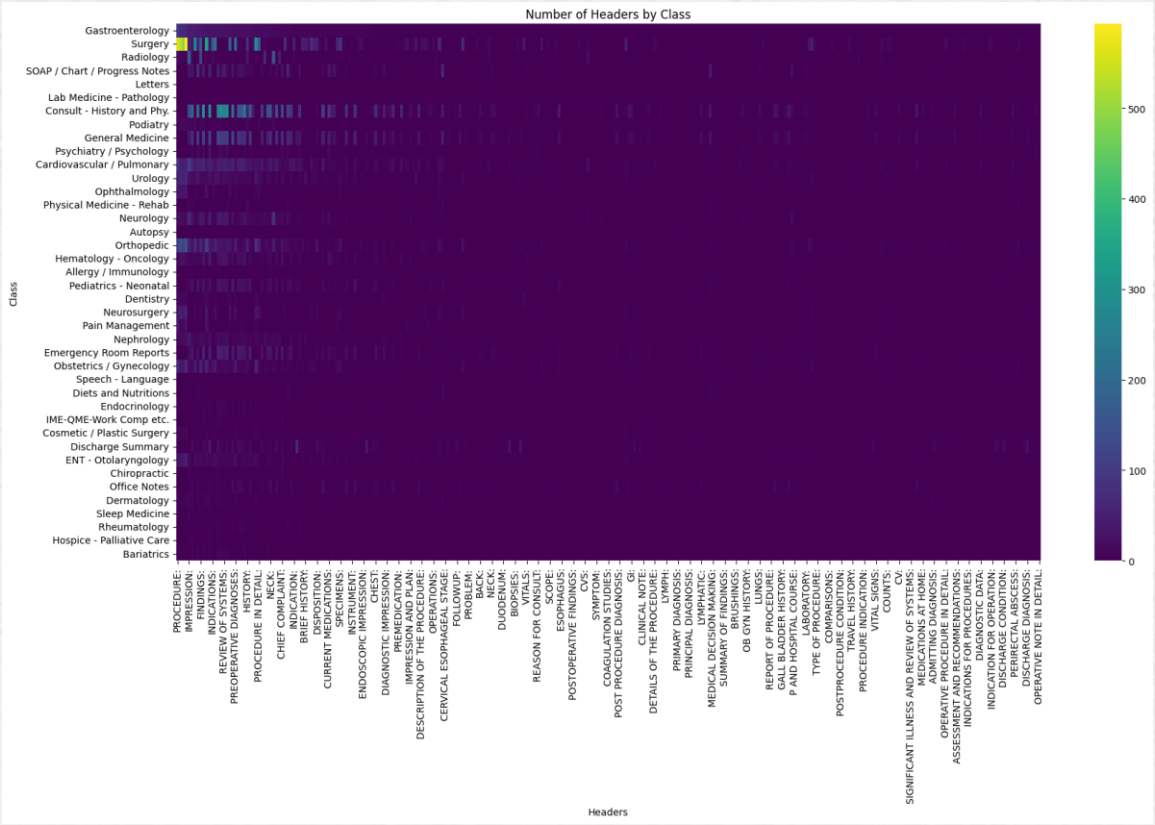
- Label Imbalance
- General vs. Specific Categories
- Rare Classes

Text Length and Label Distribution



- Majority of texts in (1000, 3000] character range
- Surgery, General Medicine, and Radiology have detailed notes
- Minimal data in extreme text length bins
- Should gather more data in less represened domains

Frequency of Headers by Class

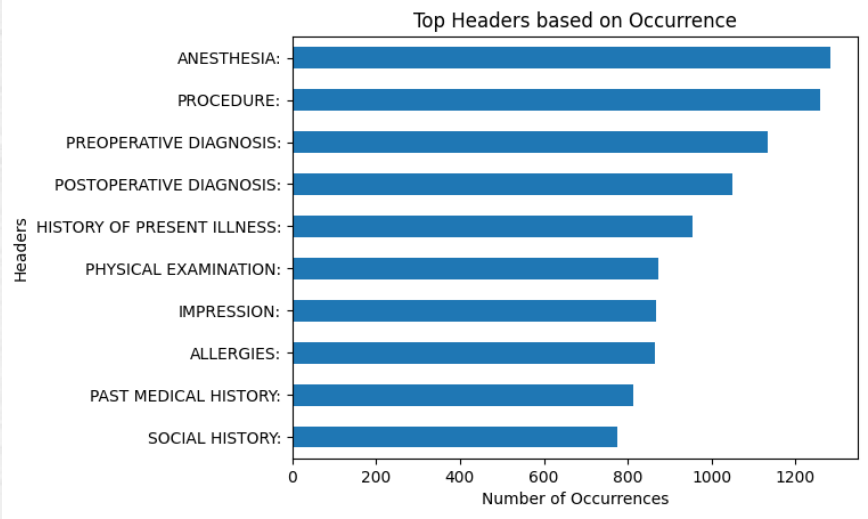


- **Selective Frequency**
  Certain headers highly prevalent within specific classes while being almost absent in others.

- **Class-Specific Terms**
  some classes have distinct set of headers: specialized documentation practices. Ex. 'ABDOMEN' in 'Gastroenterology'

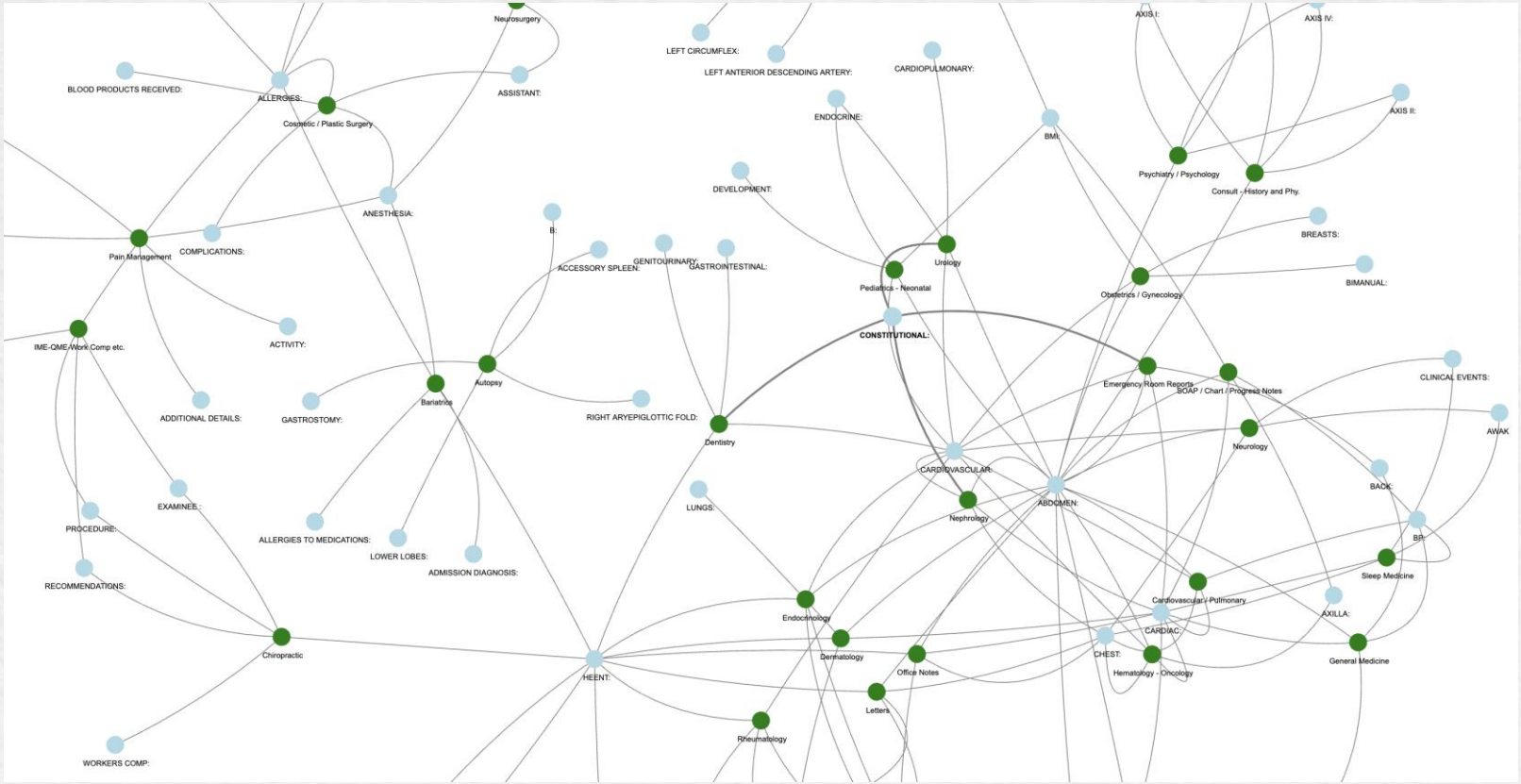
- **Common vs. Unique Headers**

Headers

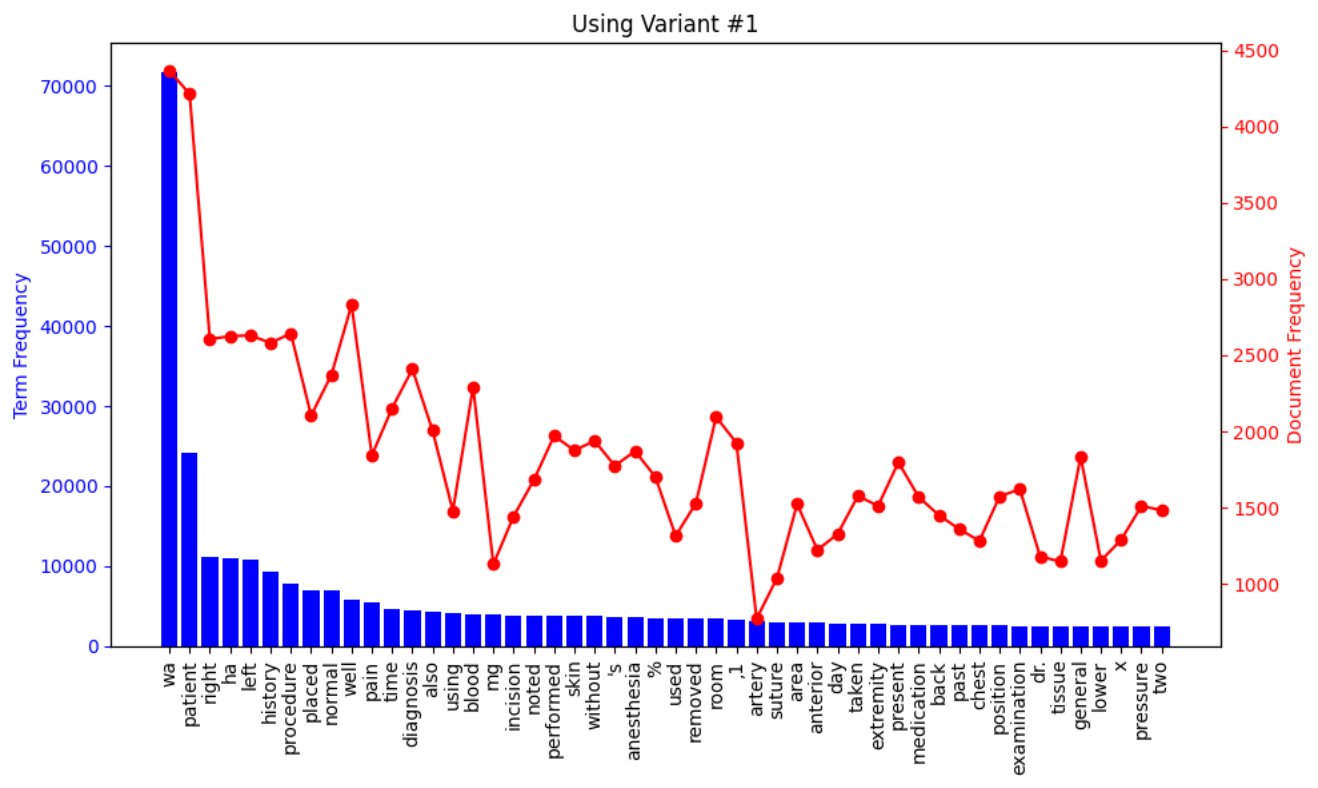


- **ANESTHESIA and PROCEDURE:** occure most
- **'ANESTHESIA':** Why such an important header?
- **Diagnoses Documentation:** Both 'PREOPERATIVE DIAGNOSIS' and 'POSTOPERATIVE DIAGNOSIS' have longer standardized texts and are more frequent headers, emphasizing diagnostic recording.
- **Historical Data:** 'PAST MEDICAL HISTORY' and 'HISTORY OF PRESENT ILLNESS' are detailed, underlining the focus on patient history.
- **Examinations:** 'IMPRESSION' and 'PHYSICAL EXAMINATION' are extensive, indicating thorough patient assessments.
- **Social & Allergy Information:** 'SOCIAL HISTORY' and 'ALLERGIES' sections are also detailed.

Top 5 Header of Classes



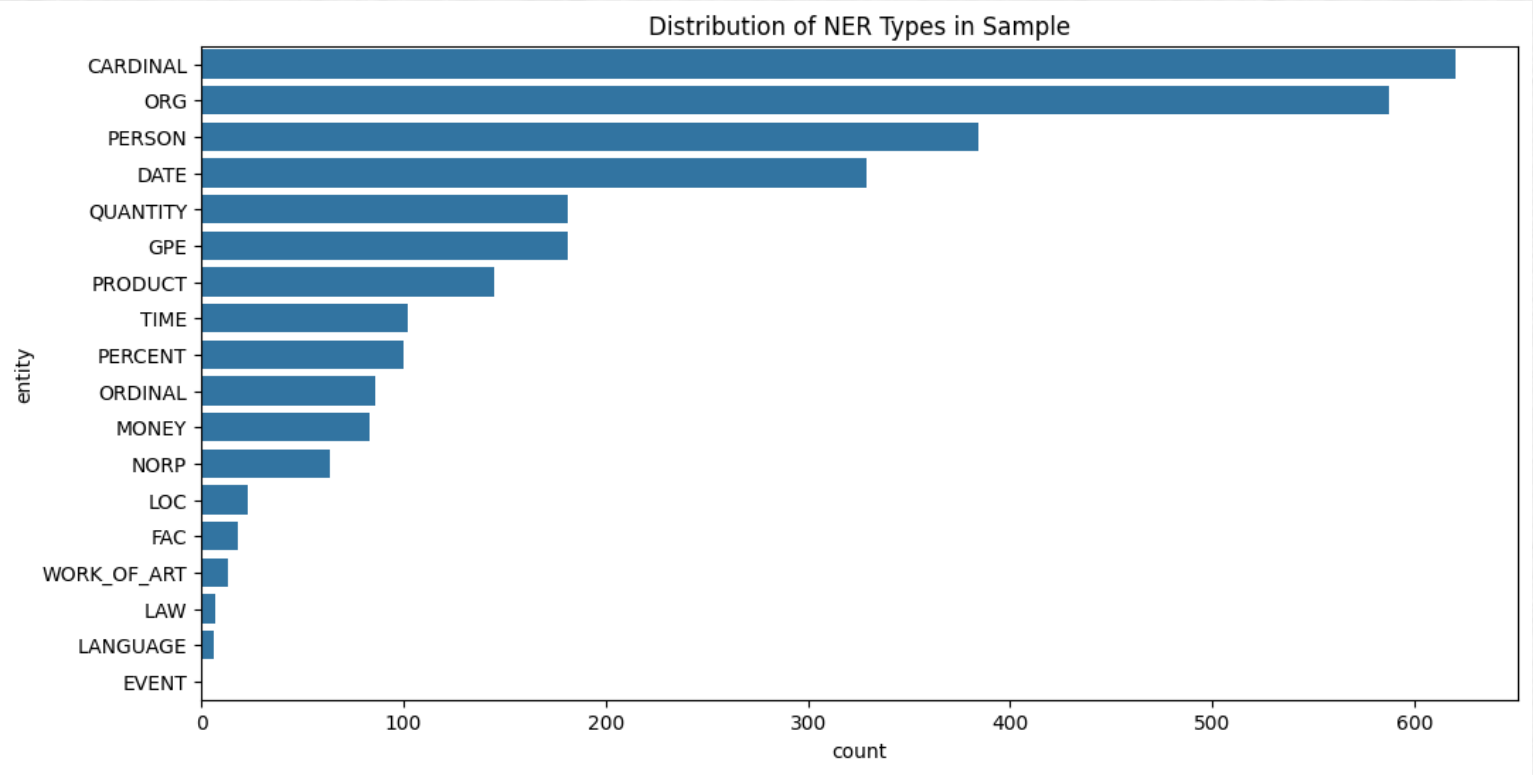
Term Frequency Distribution



Named Entity Recognition

PREOPERATIVE DIAGNOSES:,1. Bunion left foot.,2. Hammertoe, left second ORDINAL toe.,POSTOPERATIVE DIAGNOSES:,1. Bunion left foot.,2. Hammertoe, left second ORDINAL toe.,PROCEDURE PERFORMED:,1. Bunionectomy, SCARF type, with metatarsal osteotomy and internal screw fixation, left.,2. Arthroplasty PERSON left second ORDINAL toe.,HISTORY: ,This 39-year-old DATE female presents to ABCD General Hospital ORG with the above chief complaint. The patient states that she has had bunion for many months DATE . It has been progressively getting more painful at this time. The patient attempted conservative treatment including wider shoe gear without long-term relief of symptoms and desires surgical treatment.,PROCEDURE: , An IV was instituted by the Department of Anesthesia ORG in the preop holding area. The patient was transported to the operating room and placed on the operating table in the supine position with a safety belt across her lap. Copious amount of Webril were placed around the left ankle followed by a blood pressure cuff. After adequate sedation was achieved by the Department of Anesthesia ORG , a total of 15 CARDINAL cc of 0.5% PERCENT Marcaine plain was injected in a Mayo ORG and digital block to the left foot. The foot was then prepped and draped in the usual sterile orthopedic fashion. The foot was elevated from the operating table and exsanguinated with an Esmarch ORG bandage. The pneumatic ankle tourniquet was inflated to 250 CARDINAL mmHg and the foot was lowered to the operating table. The stockinette was reflected. The foot was cleansed with wet and dry sponge. Attention was then directed to the first ORDINAL metatarsophalangeal joint of the left foot. An incision was created over this area approximately 6 cm QUANTITY in length. The incision was deepened with a #15 MONEY blade. All vessels encountered were ligated for hemostasis. The skin and subcutaneous tissue was then dissected from the capsule. Care was taken to preserve the neurovascular bundle. Dorsal linear capsular incision was then created. The capsule was then reflected from the head of the first ORDINAL metatarsal. Attention was then directed to the first ORDINAL interspace where a lateral release was performed. A combination of sharp and blunt dissection was performed until the abductor tendons were identified and transected. A lateral capsulotomy was performed. Attention was then directed back to the medial eminence where sagittal saw was used to resect the prominent medial eminence. The incision was then extended proximally with further dissection down to the level of the bone. Two 0.45 CARDINAL K-wires were then inserted as access guides for the SCARF ORG osteotomy. A standard SCARF ORG osteotomy was then performed. The head of the first ORDINAL metatarsal was then translocated laterally in order to reduce the first ORDINAL interspace in the metatarsal angle. After adequate reduction of the bunion deformity was noted, the bone was temporarily fixated with a 0.45 CARDINAL K-wire. A 3.0 CARDINAL x 12 mm QUANTITY screw was then inserted in the standard AO ORG fashion with compression noted. A second ORDINAL 3.0 CARDINAL x 14 mm QUANTITY screw was also inserted with tight compression noted. The remaining prominent medial eminence medially was then resected with a sagittal saw. Reciprocating rasps were then used to smooth any sharp bony edges. The temporary fixation wires were then removed. The screws were again checked for tightness, which was noted. Attention was directed to the medial capsule where a medial capsulorrhaphy was performed. A straight stat was used to assist in removing a portion of the capsule. The capsule was then reapproximated with # 2 MONEY -0 Vicryl ORG medially. Dorsal capsule was then reapproximated with # 3 MONEY -0 Vicryl ORG in a running fashion. The subcutaneous closure was performed with #4 MONEY -0 Vicryl ORG followed by running subcuticular stitch with # 5 MONEY -0 Vicryl ORG . The skin was then closed with #4 MONEY -0 nylon in a horizontal mattress type fashion.,Attention was then directed to the left second ORDINAL toe. A dorsal linear incision was then created over the proximal phalangeal joint of the left second ORDINAL toe. The incision was deepened with a #15 MONEY blade and the skin

Named Entity Recognition



Challenges and Strategies

Complex Medical Terminology

- Finetune language models to learn additional terms.

Challenges and Strategies

Class Imbalance

- Oversample minority classes
- Undersample majority class

Challenges and Stategies

Variability in Document Length

- Normalize text length for traditional classifiers
- Or Transformer (handles variable lengths via attention)

Challenges and Stategies

Quality Assurance – Inconsistent Headers

- NER to identity/ classify medical terminology and header information

Challenges and Strategies

Missing labels for NER task

- Annotate entities for 100 samples manually.

Thank you