

PHYSICIAN SEARCH PLATFORM

Team Pinto Beans

TEAM PINTO BEANS

Akshat Agarwal

**Shengyuan Pan
(Team Leader)**

Seth Cattanach

Jia Lin Cheoh

Arindam Saha

OUTLINE

Background

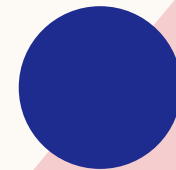
Overview

Backend Functionality

Software Description

Future Work

Appendix



BACKGROUND

Patients often face the challenge of finding a physician who specialize in treating their conditions. As of today, no master physician roster is available for healthcare consumers, and hospital internal and external platforms lack interoperability.

We aim to build a platform to enable patients to shop around for healthcare providers and provide the user with names, specialty, contact information, address of relevant physicians.

Novelty of Project

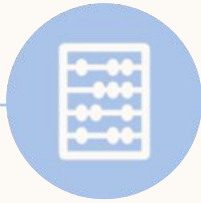
Hospitals' website usually has a search engines that enables patients to search for the doctors they need. However, these search engines usually require patients to possess medical knowledge to know exactly which specialties to target.

The most novel part of our project is to enable people who do not have medical knowledge to seek the right doctor for their illnesses.

By doing so, the patients not only can save cost, but they can also get the treatment that they need from the doctor on time.

.

OVERVIEW



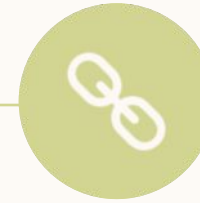
TEXT RETRIEVAL

- Scrape physician biography pages
- Scrape symptom, diseases, and their associated physician specialty
- Structure and clean text data into tabular format with standard schema and create database



TEXT MINING

- Preprocess symptoms text
- Convert to bag of words representation
- Apply TF-IDF to match user symptom to against symptoms to disease mappings
- Identify recommended specialties associated with matched symptoms

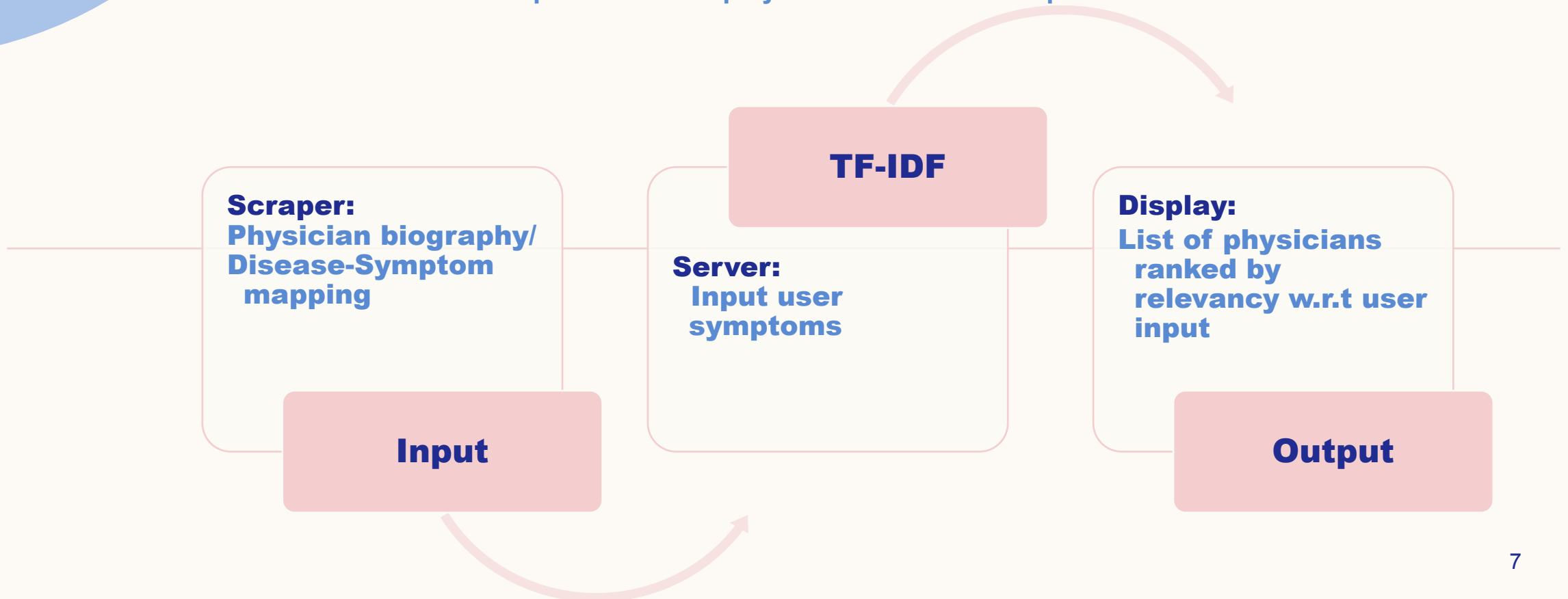


SEARCH

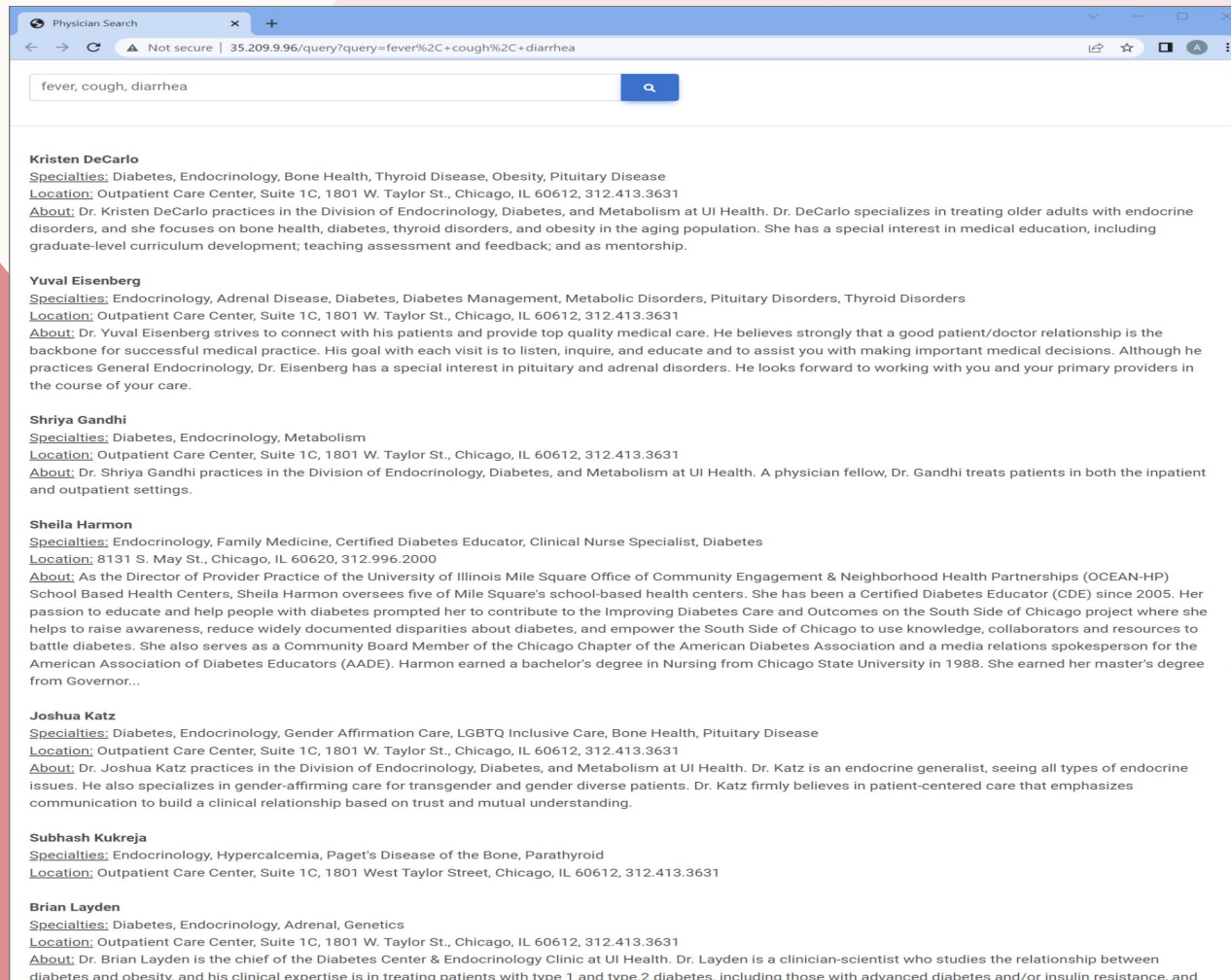
- UI accepts user symptom
- Interacts with the backend to obtain relevant specialty
- Apply TF-IDF to match physician specialties associated with doctors in the database and retrieve matched doctors
- Application hosted on Google Cloud

BACKEND FUNCTIONALITY

1. Match user symptom against Mayo symptoms to disease mapping in the database
2. Return specialties associated with the matched symptom
3. Retrieve doctors profiles for display from the identified specialties



Brief Overview on How Software Works



Physician Search

Not secure | 35.209.9.96/query?query=fever%2C+cough%2C+diarrhea

fever, cough, diarrhea

Kristen DeCarlo
Specialties: Diabetes, Endocrinology, Bone Health, Thyroid Disease, Obesity, Pituitary Disease
Location: Outpatient Care Center, Suite 1C, 1801 W. Taylor St., Chicago, IL 60612, 312.413.3631
About: Dr. Kristen DeCarlo practices in the Division of Endocrinology, Diabetes, and Metabolism at UI Health. Dr. DeCarlo specializes in treating older adults with endocrine disorders, and she focuses on bone health, diabetes, thyroid disorders, and obesity in the aging population. She has a special interest in medical education, including graduate-level curriculum development; teaching assessment and feedback; and as mentorship.

Yuval Eisenberg
Specialties: Endocrinology, Adrenal Disease, Diabetes, Diabetes Management, Metabolic Disorders, Pituitary Disorders, Thyroid Disorders
Location: Outpatient Care Center, Suite 1C, 1801 W. Taylor St., Chicago, IL 60612, 312.413.3631
About: Dr. Yuval Eisenberg strives to connect with his patients and provide top quality medical care. He believes strongly that a good patient/doctor relationship is the backbone for successful medical practice. His goal with each visit is to listen, inquire, and educate and to assist you with making important medical decisions. Although he practices General Endocrinology, Dr. Eisenberg has a special interest in pituitary and adrenal disorders. He looks forward to working with you and your primary providers in the course of your care.

Shriya Gandhi
Specialties: Diabetes, Endocrinology, Metabolism
Location: Outpatient Care Center, Suite 1C, 1801 W. Taylor St., Chicago, IL 60612, 312.413.3631
About: Dr. Shriya Gandhi practices in the Division of Endocrinology, Diabetes, and Metabolism at UI Health. A physician fellow, Dr. Gandhi treats patients in both the inpatient and outpatient settings.

Sheila Harmon
Specialties: Endocrinology, Family Medicine, Certified Diabetes Educator, Clinical Nurse Specialist, Diabetes
Location: 8131 S. May St., Chicago, IL 60620, 312.996.2000
About: As the Director of Provider Practice of the University of Illinois Mile Square Office of Community Engagement & Neighborhood Health Partnerships (OCEAN-HP) School Based Health Centers, Sheila Harmon oversees five of Mile Square's school-based health centers. She has been a Certified Diabetes Educator (CDE) since 2005. Her passion to educate and help people with diabetes prompted her to contribute to the Improving Diabetes Care and Outcomes on the South Side of Chicago project where she helps to raise awareness, reduce widely documented disparities about diabetes, and empower the South Side of Chicago to use knowledge, collaborators and resources to battle diabetes. She also serves as a Community Board Member of the Chicago Chapter of the American Diabetes Association and a media relations spokesperson for the American Association of Diabetes Educators (AADE). Harmon earned a bachelor's degree in Nursing from Chicago State University in 1988. She earned her master's degree from Governor...

Joshua Katz
Specialties: Diabetes, Endocrinology, Gender Affirmation Care, LGBTQ Inclusive Care, Bone Health, Pituitary Disease
Location: Outpatient Care Center, Suite 1C, 1801 W. Taylor St., Chicago, IL 60612, 312.413.3631
About: Dr. Joshua Katz practices in the Division of Endocrinology, Diabetes, and Metabolism at UI Health. Dr. Katz is an endocrine generalist, seeing all types of endocrine issues. He also specializes in gender-affirming care for transgender and gender diverse patients. Dr. Katz firmly believes in patient-centered care that emphasizes communication to build a clinical relationship based on trust and mutual understanding.

Subhash Kukreja
Specialties: Endocrinology, Hypercalcemia, Paget's Disease of the Bone, Parathyroid
Location: Outpatient Care Center, Suite 1C, 1801 West Taylor Street, Chicago, IL 60612, 312.413.3631

Brian Layden
Specialties: Diabetes, Endocrinology, Adrenal, Genetics
Location: Outpatient Care Center, Suite 1C, 1801 W. Taylor St., Chicago, IL 60612, 312.413.3631
About: Dr. Brian Layden is the chief of the Diabetes Center & Endocrinology Clinic at UI Health. Dr. Layden is a clinician-scientist who studies the relationship between diabetes and obesity, and his clinical expertise is in treating patients with type 1 and type 2 diabetes, including those with advanced diabetes and/or insulin resistance, and

Future Work

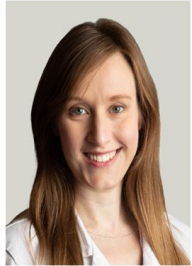
- Direct evaluation of search results by human to systematically benchmark model performance
- Implement BERT-NER or Jaccard in place of the TF-IDF model as the back-end retrieval/relevancy evaluation methodology
- Enable additional features in the web application to allow filtering of returned list of doctors by location, languages, other specialty requirements
- Incorporate publicly available EMR data, e.g., MIMIC-III to achieve more nuanced relevancy designation of patient symptoms

Appendix

- **Item A - Alternative Back-end Retrieval Functionalities**
- **Item B - Generating User Inputs Test File using GPT-3**
- **Item C - Data Source for Doctors Profile at Illinois**
- **Item D - Data Source for Symptoms, Diseases, Specialties**

BERT Demo

HOME | FIND A DOCTOR



Elisheva Coleman, MD
★★★★★ | 4.5 / 5
Assistant Professor of Neurology
[Vascular Neurology](#) [Neurology](#) | [More](#)
25 Insurance Plans Accepted
773-702-6222

UChicago Faculty Physicians

Specialties & Areas of Expertise

Specialties	Areas of Expertise
<ul style="list-style-type: none">Vascular NeurologyNeurology	<ul style="list-style-type: none">StrokeCerebrovascular Disease

[Print](#)

Departments and specialties

Mayo Clinic has one of the largest and most experienced practices in the United States, with campuses in Arizona, Florida and Minnesota. Staff skilled in dozens of specialties work together to ensure quality care and successful recovery.

Departments that treat this condition

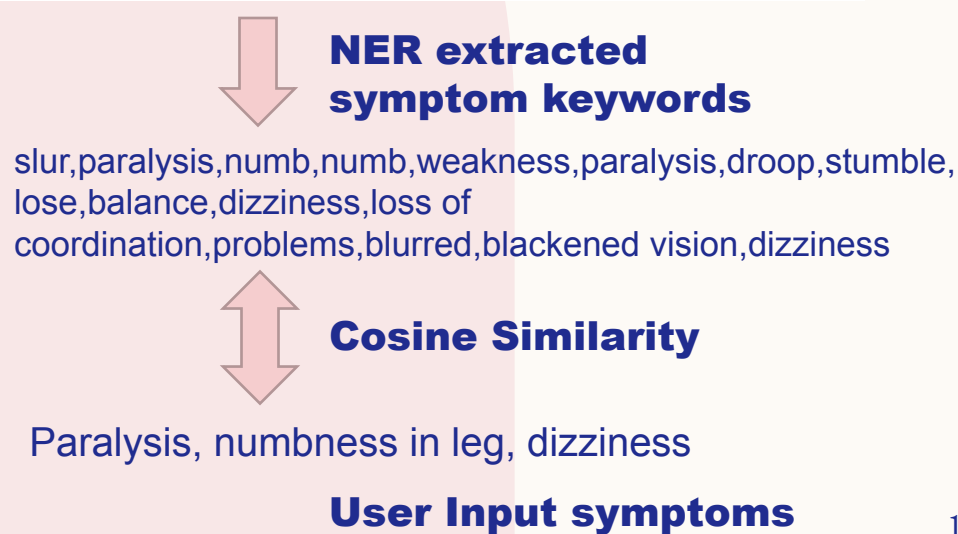
- [Cardiovascular Medicine](#)
- [Critical Care](#)
- [Emergency Medicine](#)
- [Neurology](#)
- [Neurosurgery](#)
- [Pediatric Rehabilitation](#)
- [Physical Medicine and Rehabilitation](#)
- [Radiology](#)
- [Vascular and Endovascular Surgery](#)
- [Vascular centers](#)

Symptoms

If you or someone you're with may be having a stroke, pay particular attention to the time the symptoms began. Some treatment options are most effective when given soon after a stroke begins.

Signs and symptoms of stroke include:

- **Trouble speaking and understanding what others are saying.** You may experience confusion, slur words or have difficulty understanding speech.
- **Paralysis or numbness of the face, arm or leg.** You may develop sudden numbness, weakness or paralysis in the face, arm or leg. This often affects just one side of the body. Try to raise both your arms over your head at the same time. If one arm begins to fall, you may be having a stroke. Also, one side of your mouth may droop when you try to smile.
- **Problems seeing in one or both eyes.** You may suddenly have blurred or blackened vision in one or both eyes, or you may see double.
- **Headache.** A sudden, severe headache, which may be accompanied by vomiting, dizziness or altered consciousness, may indicate that you're having a stroke.
- **Trouble walking.** You may stumble or lose your balance. You may also have sudden dizziness or a loss of coordination.



Jaccard as Baseline

Background of Jaccard Similarity

- Jaccard similarity enables us to measure the shared and distinct symptoms in a specific disease.
- Our use case: When a user input a set of symptoms, we evaluate if the symptoms match to the correct disease.
- The goal of this exercise is to have an idea on how a more advanced model like BERT would perform on the same dataset.

Test Results

- There are a total of 536 test inputs in the “UserInputSymptoms.plk” file. If we restrict the match to be only 1, we got 69 right out of the 536 inputs, which is about 12.87% accuracy.
- When we restrict the match to be 5 or 10 of the highest similarity, the accuracy will rise.

Inference

- We infer that a more advanced model like BERT should be equal in accuracy or much higher.

Data Source for Doctors Profile at Illinois

- University of Chicago Medical Center -
<https://www.uchicagomedicine.org/find-a-physician>
- University of Illinois Hospital
<https://hospital.uillinois.edu/find-a-doctor>
- Northwestern Medicine
<https://www.nm.org/doctors>
- WebMd
<https://www.webmd.com/>
- Cook County Health (John H Stroger Jr. Hospital of Cook County)
<https://cookcountyhealth.org/about/physicians-directory/>

Data Source for Symptoms, Diseases, Specialties

- Mayo Clinic - <https://www.mayoclinic.org/>

Symptoms

If you or someone you're with may be having a stroke, pay particular attention to the time the symptoms began. Some treatment options are most effective when given soon after a stroke begins.

Signs and symptoms of stroke include:

- **Trouble speaking and understanding what others are saying.** You may experience confusion, slur words or have difficulty understanding speech.
- **Paralysis or numbness of the face, arm or leg.** You may develop sudden numbness, weakness or paralysis in the face, arm or leg. This often affects just one side of the body. Try to raise both your arms over your head at the same time. If one arm begins to fall, you may be having a stroke. Also, one side of your mouth may droop when you try to smile.
- **Problems seeing in one or both eyes.** You may suddenly have blurred or blackened vision in one or both eyes, or you may see double.
- **Headache.** A sudden, severe headache, which may be accompanied by vomiting, dizziness or altered consciousness, may indicate that you're having a stroke.
- **Trouble walking.** You may stumble or lose your balance. You may also have sudden dizziness or a loss of coordination.

Departments and specialties

 [Print](#)

Mayo Clinic has one of the largest and most experienced practices in the United States, with campuses in Arizona, Florida and Minnesota. Staff skilled in dozens of specialties work together to ensure quality care and successful recovery.

Departments that treat this condition

[Cardiovascular Medicine](#)

[Critical Care](#)

[Emergency Medicine](#)

[Neurology](#)

[Neurosurgery](#)

[Pediatric Rehabilitation](#)

[Physical Medicine and Rehabilitation](#)

[Radiology](#)

[Vascular and Endovascular Surgery](#)

[Vascular centers](#)

User Inputs Test File

- GPT3 from OpenAI is used to generate the possible user inputs for all symptoms for each diseases from Mayo Clinic.
<https://www.mayoclinic.org/symptoms>
- Using the generated pseudo data, we tested the accuracy of BERT-NER model and the Jaccard model description in Item A1 and A2

THANK YOU