Identifying and Aligning Medical Claims Made on Social Media with Medical Evidence

Anthony Hughes* and Xingyi Song*

Department of Computer Science*

University of Sheffield

SLT Centre for Doctoral Training

CONTENTS

Problem

Online Health Information and EBM
Empowering patients with evidence-guided choices.

Idea

NLP for Evidence Alignment
Automating the alignment between claims and evidence

Solution

Current Data
RedHot, Trialstreamer and the lack of alignment

Synthetic Generators
Generator for synthetic data

Expansive Medical Claim Corpus
New corpus output from our sythetic claim generating process.

Results

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HEALTH INFORMATION

How can we **support** individuals in navigating the **vast** amount of **health** information available on **social media**?

Patients often turn to **social media** for support on their conditions, however it can be challenging for both medical and non-medical persons to discern whether information is **reliable** and **evidence-based.**
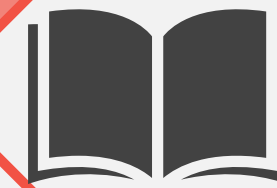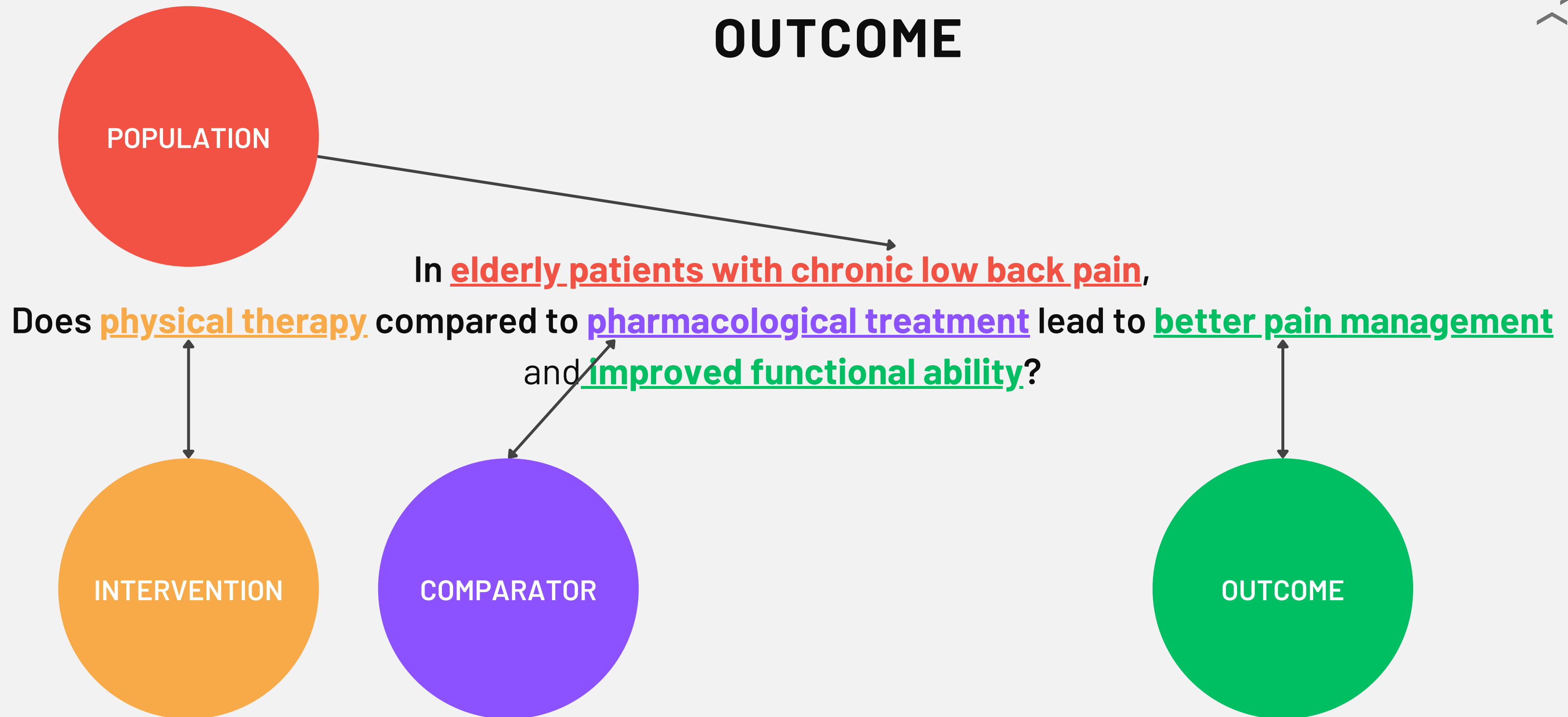
EVIDENCE-BASED MEDICINE

Evidence-based medicine is the practise of making **medical decisions**, where those decisions are **informed** by the entirety of the **current and best evidence** available.
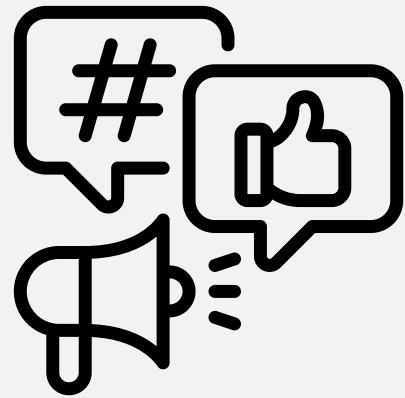
This **evidence** often comes in the form of **randomised control trials** (RCT). RCT's can be further aggregated into **meta-analyses** and **systematic reviews**. The basis of these documents are constructed via the **PICO** framework

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POPULATION, INTERVENTION, COMPARATOR, OUTCOME

POPULATION

INTERVENTION

COMPARATOR

OUTCOME

In **elderly patients with chronic low back pain**,
Does **physical therapy** compared to **pharmacological treatment** lead to **better pain management** and **improved functional ability**?

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EXAMPLE OF CLAIM TO EVIDENCE ALIGNMENT

Claim and PICO Annotation Example (*RedHot Corpus*)

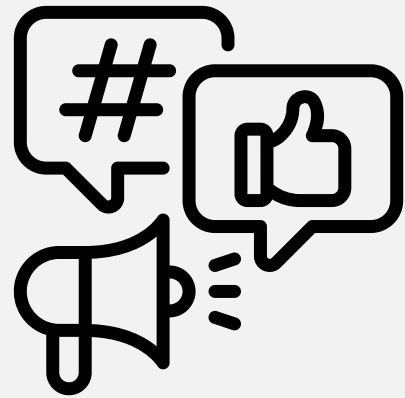**Dexo** cured his **croup** and **fixed his breathing**!

MAGIC ALIGNMENT PROCESS

Randomised Control Trial and PICO Annotation (*Trialstreamer*)

Prednisolone Versus **Dexamethasone** for **Croup**: a Randomized Controlled Trial

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DATASETS

REDHOT CORPUS

A **corpus** of **social media posts** (reddit) annotated with spans of **PICOs** and **Medical Claims**.

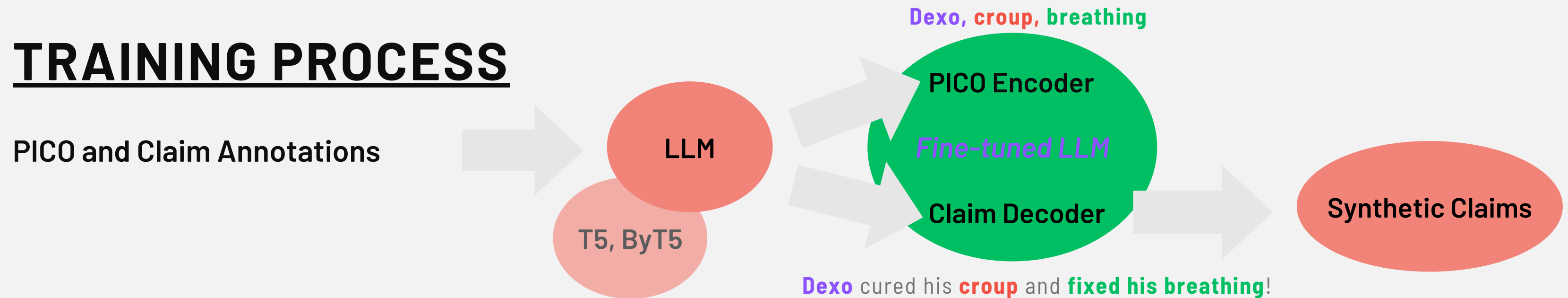**Non-expert/human curated corpus and lacks clinical breadth.**

TRIALSTREAMER DATASET

Contains **millions** of instances of machine annotated **PICOs to medical evidence abstract pairs** across all medical topics.

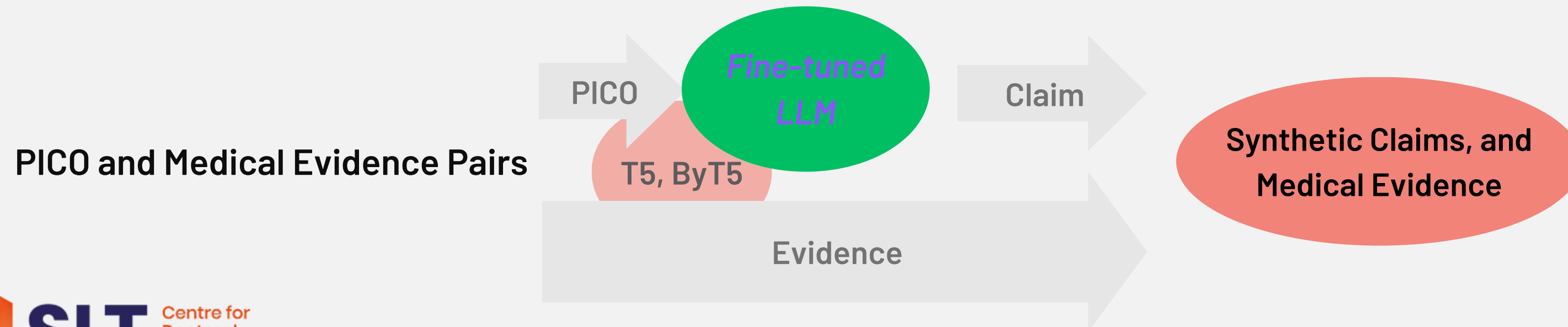**Not paired with medical claims. Too big for human alignment.**

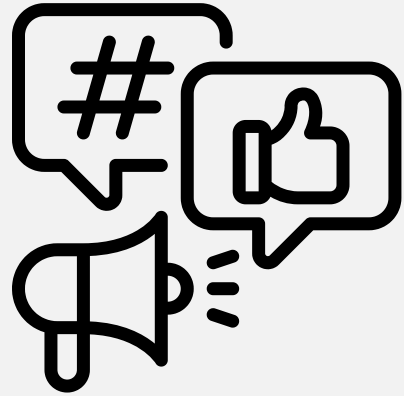**How do we build an evidence retrieval system for pairs it hasn't seen before?**

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SYNTHETIC GENERATOR

TRAINING PROCESS

PICO and Claim Annotations

LLM

T5, ByT5

Dexo, croup, breathing

PICO Encoder

Fine-tuned LLM

Claim Decoder

Synthetic Claims

Dexo cured his croup and fixed his breathing!

GENERATING SYNTHETIC CLAIMS

PICO and Medical Evidence Pairs

PICO

Fine-tuned LLM

T5, ByT5

Claim

Evidence

Synthetic Claims, and Medical Evidence

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GOOD SYNTHETIC CLAIM EXAMPLES

PICO to Synthetic Claim Examples

Gout, Food, Flare-ups.

Pubmed ID: 32620199.

"I got my first **attack** in February

and was following the advice of avoiding **high purine foods**"

Coronary Heart Disease, Vitamin K, Vascular Calcinosis.
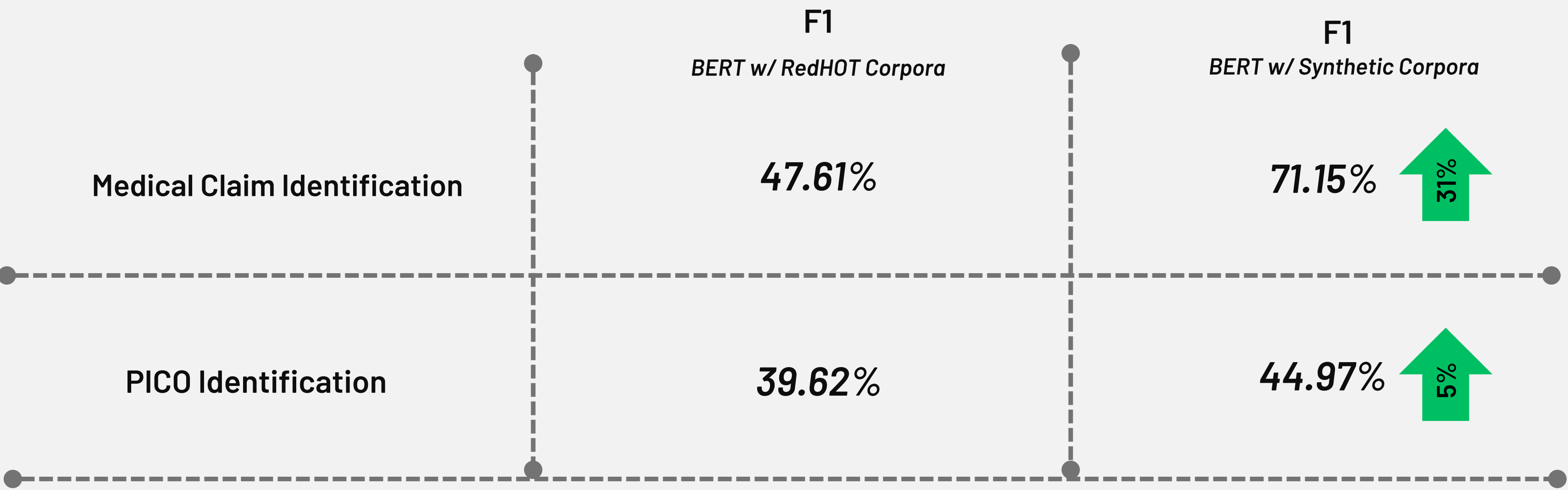
Pubmed ID: 15514282.

"Because I heard it helps with certain medical conditions. I

know it can have **psychoactive effects** too"

EVIDENCE RETRIEVAL

Alignment via Dense Passage Retrieval

PICO and Claim Encoder
BERT

Evidence Encoder
BERT

Synthetic Claims
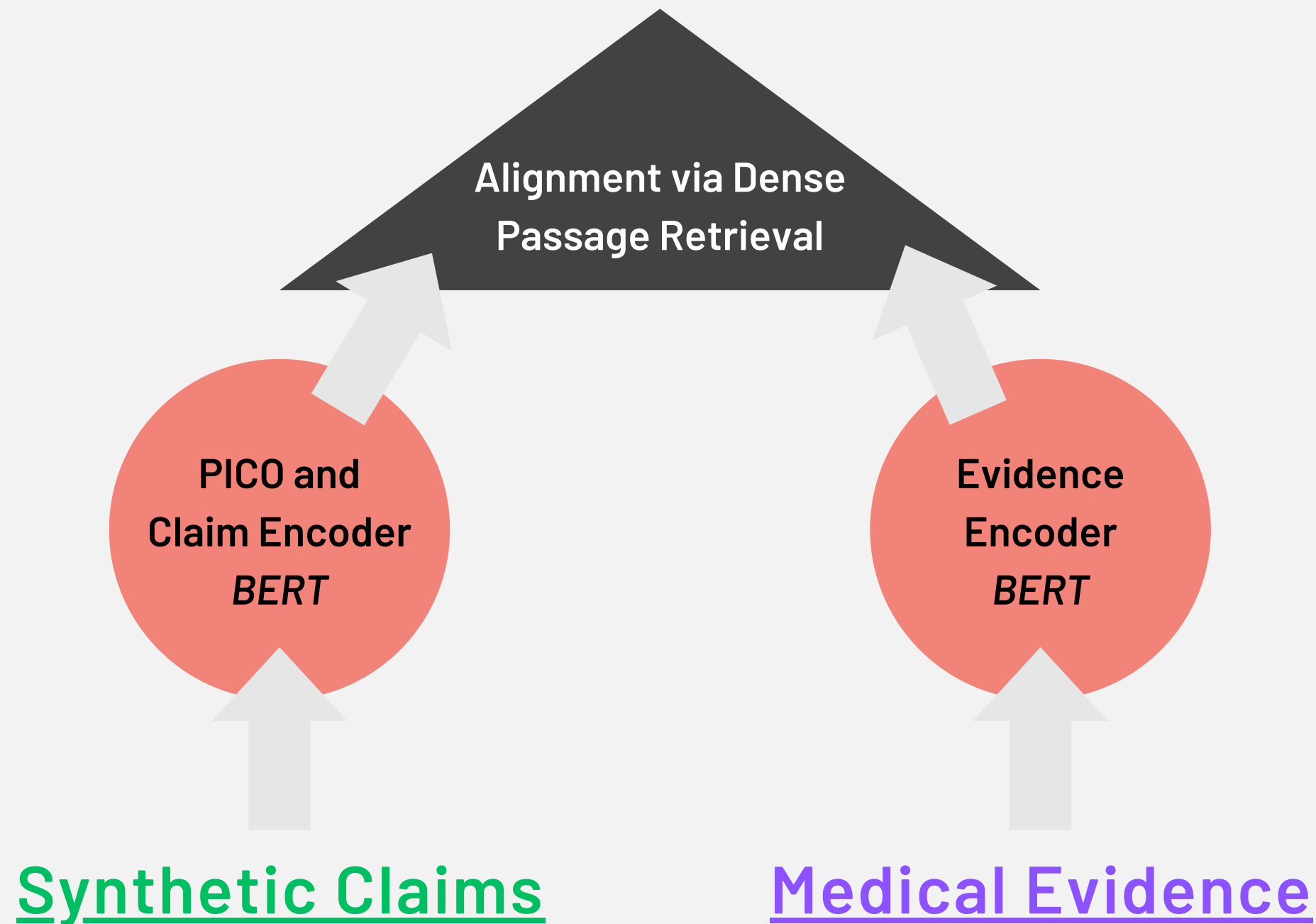
Medical Evidence

- **Evidence retrieval** can be framed as a *question-answering task*,

- We use the PIO elements and the medical claim as the question and the answer is a set of relevant medical abstracts.

- The aim of the evidence retrieval component is to retrieve the most pertinent evidence in relation to a given medical claim and it's associated PIO data.

- We use a dual-encoder dense passage retriever (DPR) for alignment.

- The goal is to create a vector space such that relevant pairs of claims and evidence will have smaller distance, i.e., higher similarity. This means training the encoders so that the dot-product similarity between the outputs of those encoders is higher.

CLAIM AND PICO CLASSIFICATION RESULTS

	F1 *BERT w/ RedHOT Corpora*	**F1** *BERT w/ Synthetic Corpora*
Medical Claim Identification	47.61%	71.15% ↑ 31%
PICO Identification	39.62%	44.97% ↑ 5%

Test set is taken from the real examples in RedHOT

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EVIDENCE RECALL EVALUATION

- We look to utilise the naturally occurring claims from the RedHOT corpora.
- Query our trained evidence retrieval system with those claims.
- An expert, in the form of a qualified doctor currently practising as a first year general practitioner (GP), is utilised to perform the analysis.
- We then asked the expert to allocate a relevancy score to each of the 5 abstracts.

Category	_Precision @ K = 5_
Highly Relevant	3
Relevant	13
Somewhat Relevant	23
Irrelevant	36

THANK YOU!

Anthony Hughes

Department of Computer Science

University of Sheffield