

Remote Work across Jobs, Companies, and Space

Stephen Hansen (UCL), Peter Lambert (LSE), Nick Bloom (Stanford),
Steven Davis (Hoover), Yabra Muvdi (ETH), Raffaella Sadun (Harvard),
Bledi Taska (Lightcast)

Job Posting Data

Our project uses the universe of online job postings provided by **Lightcast** (formerly Burning Glass)

First contribution is to use a large language model (LLM) fit to human labels to build a classifier for remote and hybrid work

- Highlight trade-off between accuracy and complexity
- Importance of training sample size

Second contribution is to document granular heterogeneity in remote work adoption across occupations, locations, and firms

Outputs available on www.wfhmap.com

Data Structure

Each job posting contains:

1. Structured metadata on occupation, location, firm, posting date
2. Unstructured text data describing relevant aspects of position

Sample begins in 2014, updated monthly

English-speaking countries: USA, UK, Canada, A/NZ

5% random sample from each country taken through 2018

Table: Counts of Vacancy Postings, Employers, and Cities, January 2014 to January 2023

(1)	(2)	(3)	(4)
Country	Vacancies	Employers	Cities
New Zealand	1,700,523	36,201	67
Australia	8,607,160	197,870	59
Canada	11,711,357	712,577	3,691
United Kingdom	74,576,747	876,103	2,268
United States	161,872,915	3,485,630	31,635
Total	258,468,702	5,308,381	37,720

Note: Reported counts pertain to the universe of online postings from January 2019 onwards and a 5% random sample from 2014 to 2018, after we drop about 6% of the postings in the data-cleaning steps described in Appendix A. We rely on Lightcast’s proprietary algorithm to identify employers and cities.

Dictionary Method

Much of the text-as-data literature in economics has been based on keyword search, aka dictionary methods

Adrian et. al. (2021) uses this approach to measure remote work adoption with cross-country Indeed.com data

Draca et. al. (2022) uses it on our same UK Lightcast data sample

Software Developer

Pearson ★★★★★ 2,739 reviews

Australia

Remote

Full-time

You must create an Indeed account before continuing to the company website to apply

Apply on company site



Our purpose: At Pearson we ‘add life to a lifetime of learning’ so everyone can realise the life they imagine. We do this by creating vibrant and enriching learning experiences designed for real-life impact.

Our company: Pearson was founded in 1844 and has been built on our ability to grow with and adapt to a constantly evolving market. Our 20,000+ employees are dedicated to creating the high-quality, digital-first, accessible and sustainable resources for lifelong learning.

Flexible working: Pearson is committed to hybrid working practices. When you are not working from home, you’ll be based in our Nunawading office that has free parking and is walking distance to 2 train station. This is a great location for those that are not a fan of the city commute.

The Role : As a Software Engineer, you will be joining one of our cross-functional scrum teams and will play a key role in the development of our online assessment platform. Reporting to our Engineering Manager, you will work from home and collaborate via telecommuniting platforms.

What you will do:

Expense Processor (Remote U.S.A.)

Plus Relocation ★★★★★ 17 reviews

Minneapolis, MN 55426 • Remote

Full-time

You must create an Indeed account before continuing to the company website to apply

Apply on company site



Job details

Job Type:

Full-time

Work From Home:

Allowed

Location:

Anywhere

Full Job Description

Plus Relocation is looking for a numbers driven, detail

Software Developer

Pearson ★★★★★ 2,739 reviews

Australia

Remote

Full-time

You must create an Indeed account before continuing to the company website to apply

[Apply on company site](#)



Our purpose: At Pearson we 'add life to a lifetime of learning' so everyone can realise the life they imagine. We do this by creating vibrant and enriching learning experiences designed for real-life impact.

Our company: Pearson was founded in 1844 and has been built on our ability to grow with and adapt to a constantly evolving market. Our 20,000+ employees are dedicated to creating the high-quality, digital-first, accessible and sustainable resources for lifelong learning.

Flexible working: Pearson is committed to hybrid working practices. When you are not working from home, you'll be based in our Nunawading office that has free parking and is walking distance to 2 train station. This is a great location for those that are not a fan of the city commute.

The Role : As a Software Engineer, you will be joining one of our cross-functional scrum teams and will play a key role in the development of our online assessment platform. Reporting to our Engineering Manager, you will work from home and collaborate via telecommuting platforms.

What you will do:

Expense Processor (Remote U.S.A.)

Plus Relocation ★★★★★ 17 reviews

Minneapolis, MN 55426 • Remote

Full-time

You must create an Indeed account before continuing to the company website to apply

[Apply on company site](#)



Job details

Job Type:

Full-time

Work From Home:

Allowed

Location:

Anywhere

Full Job Description

Plus Relocation is looking for a numbers driven, detail

Deputy Home Care Manager

Habitation Care Ltd

Brighton BN1

£21,246 - £26,289 a year - Full-time, Part-time, Temporary contract, Fixed term contract, Temp to perm

[Apply now](#)



We are looking for a Deputy Home Manager with domiciliary care experience to join our company. You will work from home care facilities with a strong track record of quality service.

The person we are looking for must have a positive, and a can-do work attitude at all time.

The person we are looking for must have at least 1 years working experience in a domiciliary care or care home managers role.

The role is for 38 hours per week plus on call duties, and sometimes cover of care calls would be required.

The person will be preparing supporting the Registered manager to carryout daily tasks.

Job Types: Full-time, Part-time, Fixed term, Temp to perm

Contract length: 36 months

Part-time hours: 38 per week

General Builder (Bricklayer Based)

Birkby Construction Limited

Maidstone

£14.50 an hour - Full-time, Permanent

[Apply now](#)



General Builder (bricklayer based) required for Small Works Department of Birkby Construction Limited on a PAYE basis. Company vehicle provided. Applicant must be self-motivated and confident. Willing to remote work sites.

Job Types: Full-time, Permanent

Work from Home: Not Available

Salary: £14.50 per hour

Benefits:

- Company car

Schedule:

- Monday to Friday

Licence/Certification:

- CSCS (preferred)

Deputy Home Care Manager

Habitation Care Ltd

Brighton BN1

£21,246 - £26,289 a year - Full-time, Part-time, Temporary contract, Fixed term contract, Temp to perm

Apply now



We are looking for a Deputy Home Manager with domiciliary care experience to join our company. You will **work from home** care facilities with a strong track record of quality service.

The person we are looking for must have a positive, and a can-do work attitude at all time.

The person we are looking for must have at least 1 years working experience in a domiciliary care or care home managers role.

The role is for 38 hours per week plus on call duties, and sometimes cover of care calls would be required.

The person will be preparing supporting the Registered manager to carryout daily tasks.

Job Types: Full-time, Part-time, Fixed term, Temp to perm

Contract length: 36 months

Part-time hours: 38 per week

General Builder (Bricklayer Based)

Birkby Construction Limited

Maidstone

£14.50 an hour - Full-time, Permanent

Apply now



General Builder (bricklayer based) required for Small Works Department of Birkby Construction Limited on a PAYE basis. Company vehicle provided. Applicant must be self-motivated and confident. Willing to **remote work** sites.

Job Types: Full-time, Permanent

Work from Home: Not Available

Salary: £14.50 per hour

Benefits:

- Company car

Schedule:

- Monday to Friday

Licence/Certification:

- CSCS (preferred)

Deputy Home Care Manager

Habitation Care Ltd

Brighton BN1

£21,246 - £26,289 a year - Full-time, Part-time, Temporary contract, Fixed term contract, Temp to perm

[Apply now](#)



We are looking for a Deputy Home Manager with domiciliary care experience to join our company. You will work from **home care facilities** with a strong track record of quality service.

The person we are looking for must have a positive, and a can-do work attitude at all time.

The person we are looking for must have at least 1 years working experience in a domiciliary care or care home managers role.

The role is for 38 hours per week plus on call duties, and sometimes cover of care calls would be required.

The person will be preparing supporting the Registered manager to carryout daily tasks.

Job Types: Full-time, Part-time, Fixed term, Temp to perm

Contract length: 36 months

Part-time hours: 38 per week

General Builder (Bricklayer Based)

Birkby Construction Limited

Maidstone

£14.50 an hour - Full-time, Permanent

[Apply now](#)



General Builder (bricklayer based) required for Small Works Department of Birkby Construction Limited on a PAYE basis. Company vehicle provided. Applicant must be self-motivated and confident. Willing to **remote work sites.**

Job Types: Full-time, Permanent

Work from Home: Not Available

Salary: £14.50 per hour

Benefits:

- Company car

Schedule:

- Monday to Friday

Licence/Certification:

- CSCS (preferred)

Obtaining Human Labels

We select 10,000 sequences of job posting text with mix of:

- Dictionary terms from existing literature
- Negated dictionary terms
- Generic keywords (home, remote, etc.)
- Random sample

Each passage is labeled by three workers on Amazon Mechanical Turk, which yields **30,000 human-based classifications**

Workers asked to identify if sequence is consistent with job offering **remote work at least one day per week**

Agreement rate is above 90%

Algorithm Zoo

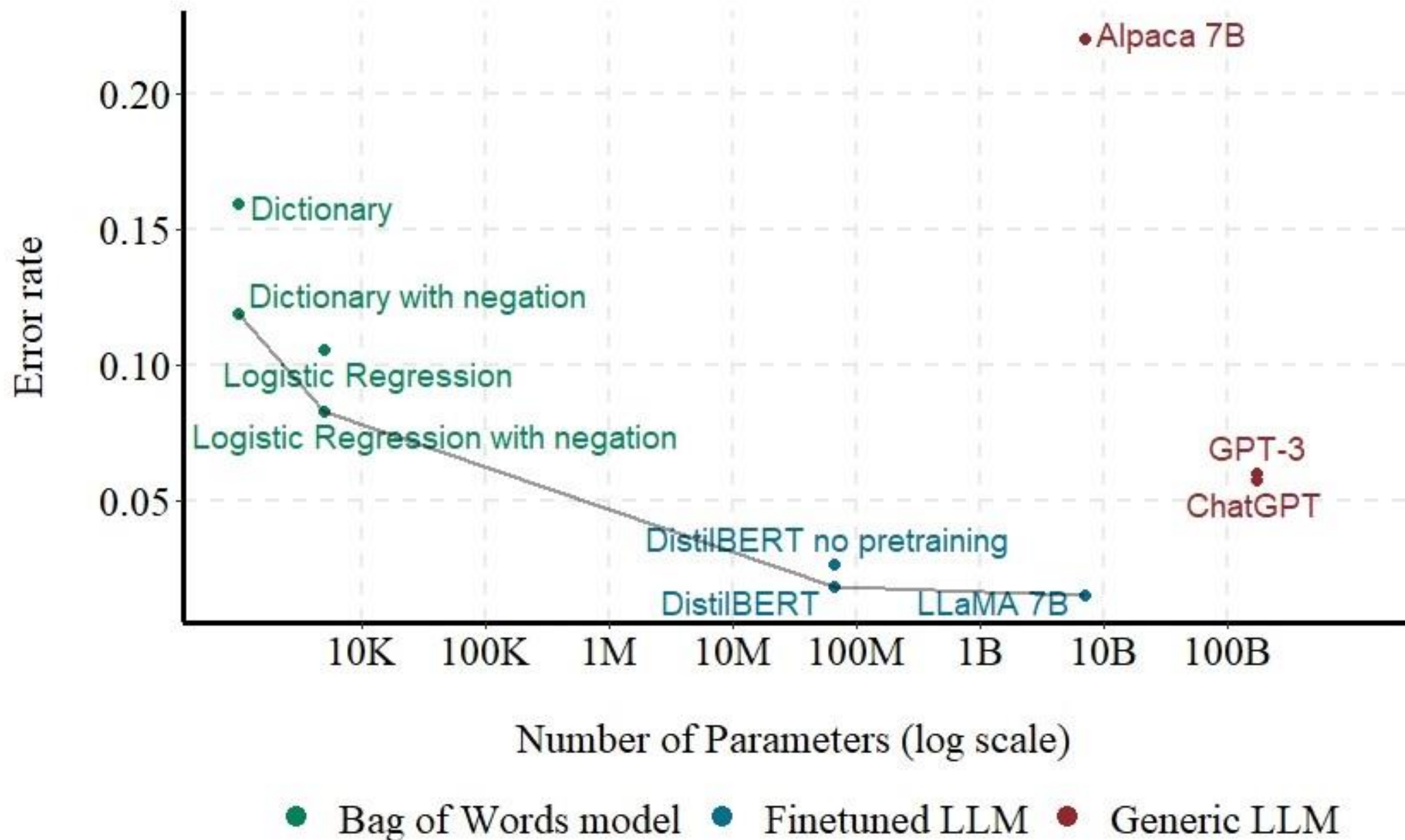
We evaluate three broad classes of algorithm to predict human labels

1. **Bag-of-words models:** dictionary, logistic regression (+ negation)
2. **Generic large language models:** GPT3, ChatGPT, Alpaca
3. **Fine-tuned large language models:** DistilBERT, LLaMA

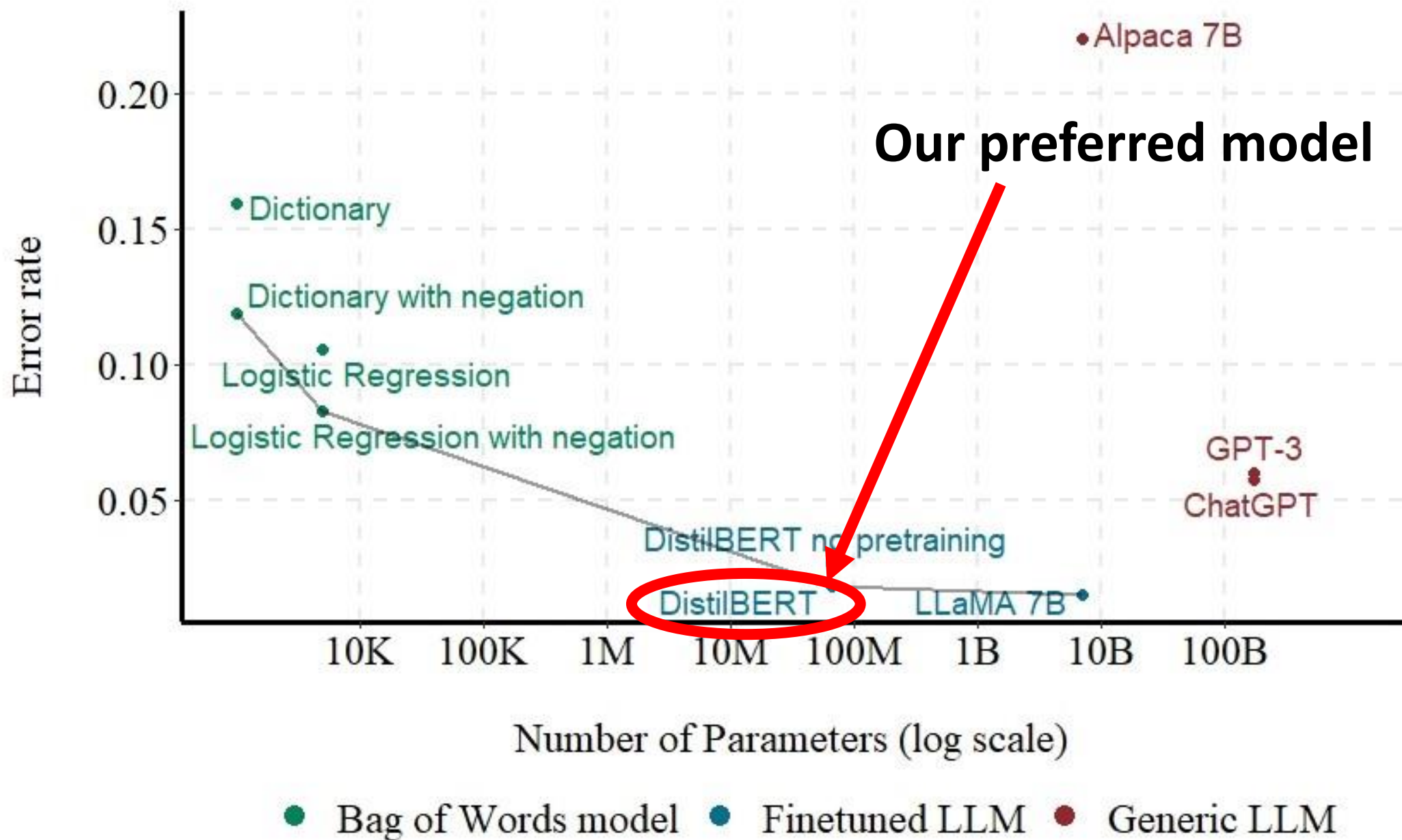
Trainable models are fit on 17,850 human labels.

All models evaluated with test-set error rate computed on 4,050 sequences (majority rule generates true label).

Trade-off in model choice



Trade-off in model choice



Training Sample Size

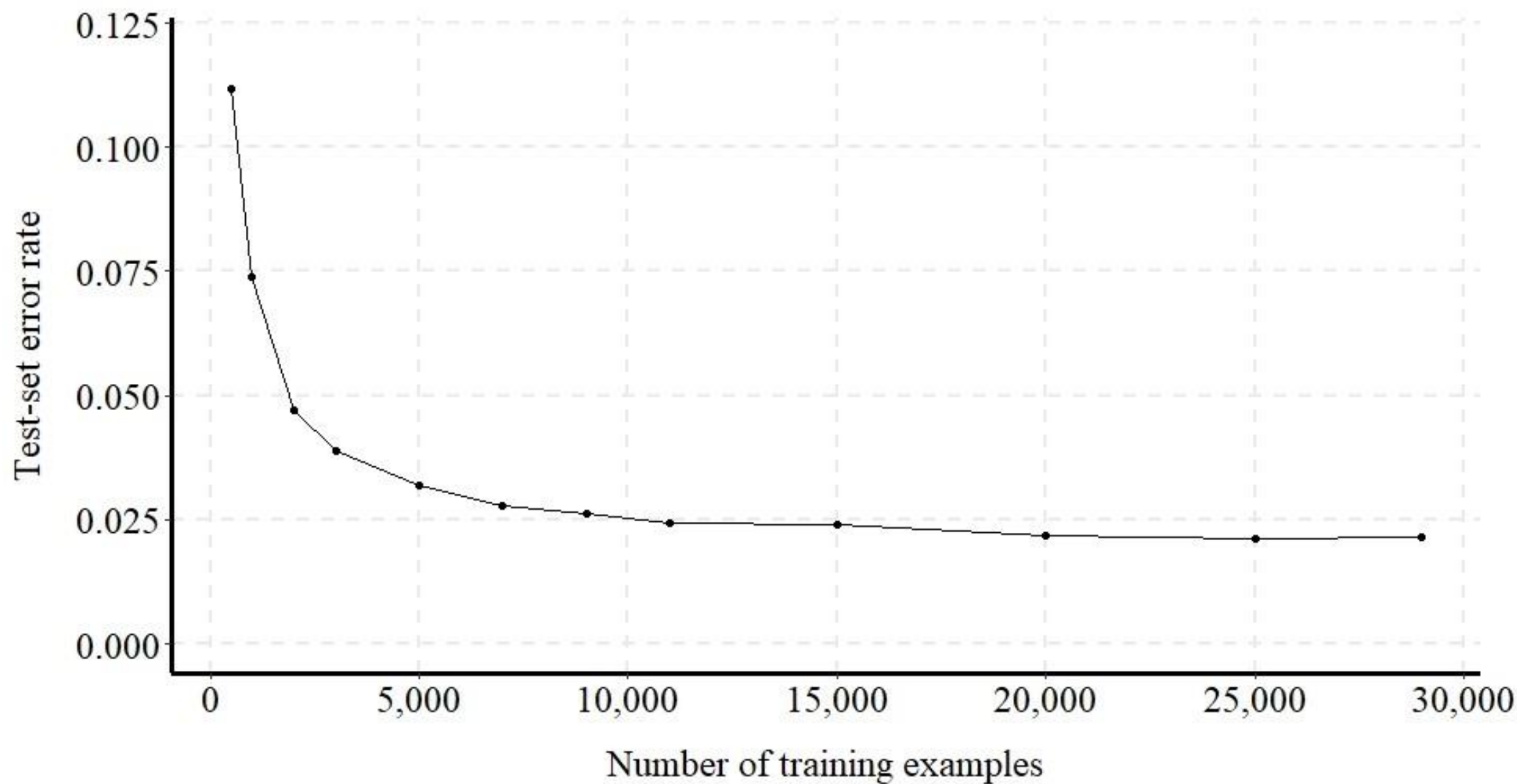
Shapiro et. al. (2022) finds limited gains to BERT beyond negated dictionaries for predicting the sentiment of news articles

However, the sentiment training sample is smaller than 1,000

How big a training sample does DistilBERT require to achieve good performance?

We repeat test-set error evaluation for random draws of varying sizes from our training data

Evolution of test-set error rate in training sample size



Overall Classification Approach

Segment each job posting into sequences of roughly uniform size

Classify each sequence a 0 or 1 using fine-tuned DistilBERT

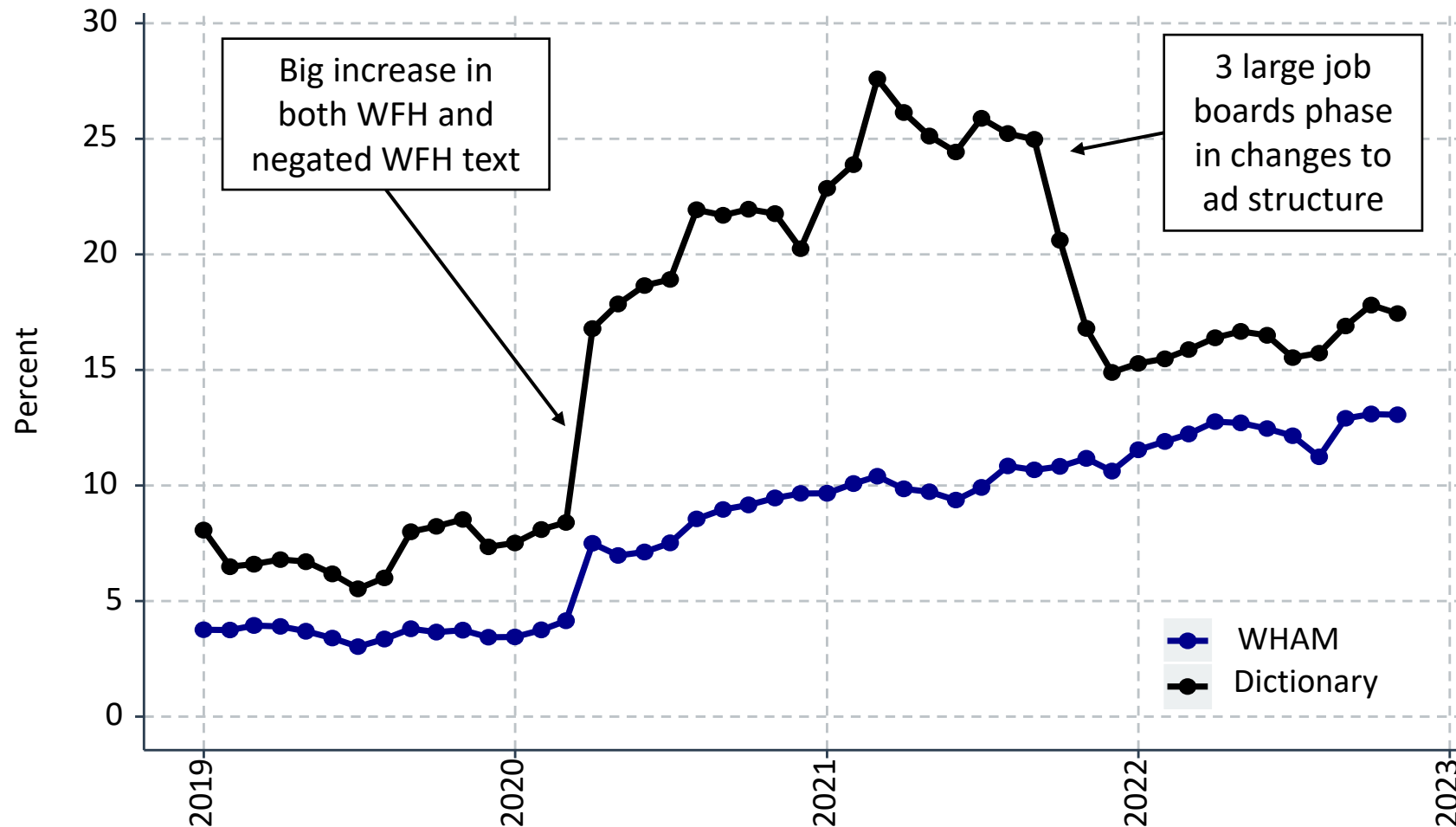
Classify overall posting according to maximum classification

Demo at <https://huggingface.co/spaces/yabramuvdi/wfh-app-v2>

Result is a **flow** measure that captures firms' **willingness to commit** to remote work, which can differ from stock of remote workers

Figure: WHAM and Dictionary Methods Applied to U.S. Vacancy Postings

Postings Classified as Job Allows Hybrid or Fully Remote Work



Note: This figure shows the percent of postings that say the job allows one or more remote workdays per week, as classified by WHAM (blue) and a dictionary-based approach (black) using the keywords in Adrjan et al. (2021). For both methods, we reweight the data to match the U.S. occupational distribution of vacancies in 2019 at the six-digit SOC level.

Data

We **encourage other researchers** and interested parties to explore our dataset, and utilise it in their own work.

Please **cite our working paper** when using these data: ***“Remote Work across Jobs, Companies, and Space” (Hansen, Lambert, Bloom, Davis, Sadun & Taska, 2023).***

Data Categories

Category A: **Readily Available!**

- Monthly country-level statistics for United States, United Kingdom, Australia, Canada, and New Zealand
- Monthly occupation-level statistics (2-digit US SOC) for the United States

Download here

Category B: **Readily Available (with sign-up)**

- Monthly Industry-level statistics (NAICS 2-digit sector) for the United States
- Monthly occupation-level statistics (2-digit US SOC) for the United States
- **NEW!** Monthly city-level statistics (for **150+** cities) for the United States
- **NEW!** Monthly city-level statistics (for **40+** cities) for the United Kingdom

Sign-up to access these data.