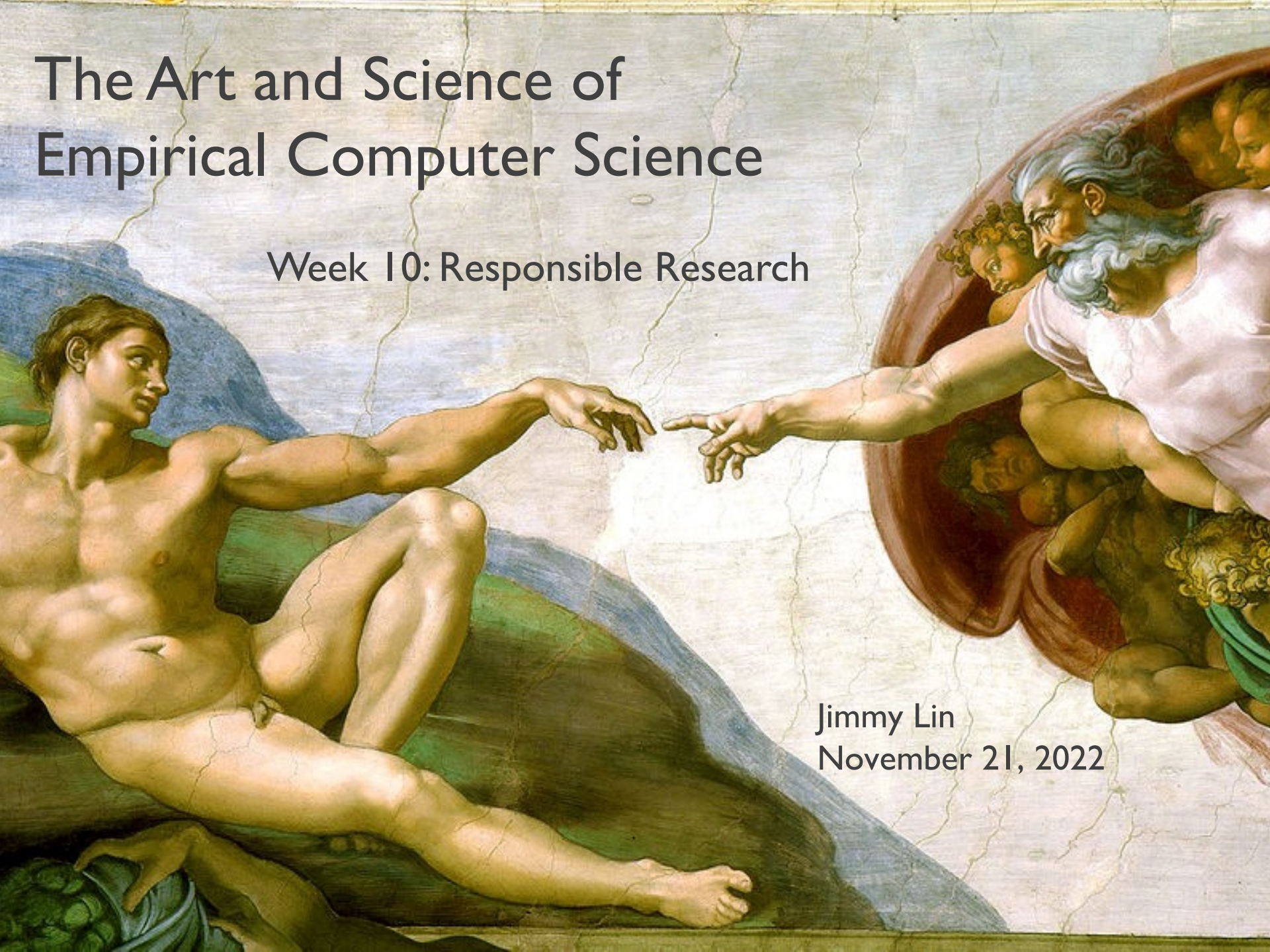
The Art and Science of Empirical Computer Science



Week 10: Responsible Research

Jimmy Lin
November 21, 2022

Wikipedia – Trinity (nuclear test)

WTF: The Who to Follow Service at Twitter

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ABSTRACT

WTF ("Who to Follow") is Twitter's user recommendation service, which is responsible for creating millions of connections daily between users based on shared interests, common connections, and other related factors. This paper provides an architectural overview and shares lessons we learned in building and running the service over the past few years. Particularly noteworthy was our design decision to process the entire Twitter graph in memory *on a single server*, which significantly reduced architectural complexity and allowed us to develop and deploy the service in only a few months. At the core of our architecture is Cassovary, an open-source in-memory graph processing engine we built from scratch for WTF. Besides powering Twitter's user recommendations, Cassovary is also used for search, discovery, promoted products, and other services as well. We describe and evaluate a few graph recommendation algorithms implemented in Cassovary, including a novel approach based on a combination of random walks and SALSA. Looking into the future, we revisit the design of our architecture and comment on its limitations, which are presently being addressed in a second-generation system under development.

Categories and Subject Descriptors: H.2.8 [Database Management]: Database applications—*Data mining*

General Terms: Algorithms, Design

Keywords: graph processing, link prediction, Hadoop

1. INTRODUCTION

The lifeblood of a vibrant and successful social media service is an active and engaged user base. Therefore, maintaining and expanding the active user population is a top goal of WTF ("Who to Follow"),[1] the Twitter user recommendation service. In the current interface, the WTF box is prominently featured in the left rail of the web client as well as in many other contexts across multiple platforms. WTF suggests Twitter accounts that a user may be interested in following, based on shared interests, common connections, and a number of other factors. Social networking sites such as Facebook and LinkedIn have comparable offerings as well. We identify two distinct but complementary facets to the problem, which we informally call "interested in" and "similar to". For example, a user interested in sports might follow @espn, but we probably wouldn't consider that user similar to @espn. On the other hand, two users might be considered similar based on their shared interest in, say, basketball, or if they follow many of the same users. Twitter also exposes profile similarity as a product feature, visible when visiting a user's profile page. Throughout this paper, our discussion of user recommendations covers both these aspects. Based on the homophily principle, similar users also make good suggestions. Besides powering user recommendations, WTF is also used for search relevance, discovery, promoted products, and other services as well.

This paper provides an overview of Twitter's WTF service, a project that began in spring 2010 and went into production the same summer.[2] Quite explicitly, our goal here is not to present novel research contributions, but to share the overall design of a system that is responsible for creating millions of connections daily and lessons that we have learned over the past few years.

We view this paper as having the following contributions:

- First, we explain and justify our decision to build the ser-

“The best minds of my generation are thinking about how to make people click ads. That sucks.”

– Jeff Hammerbacher

Distributive Justice

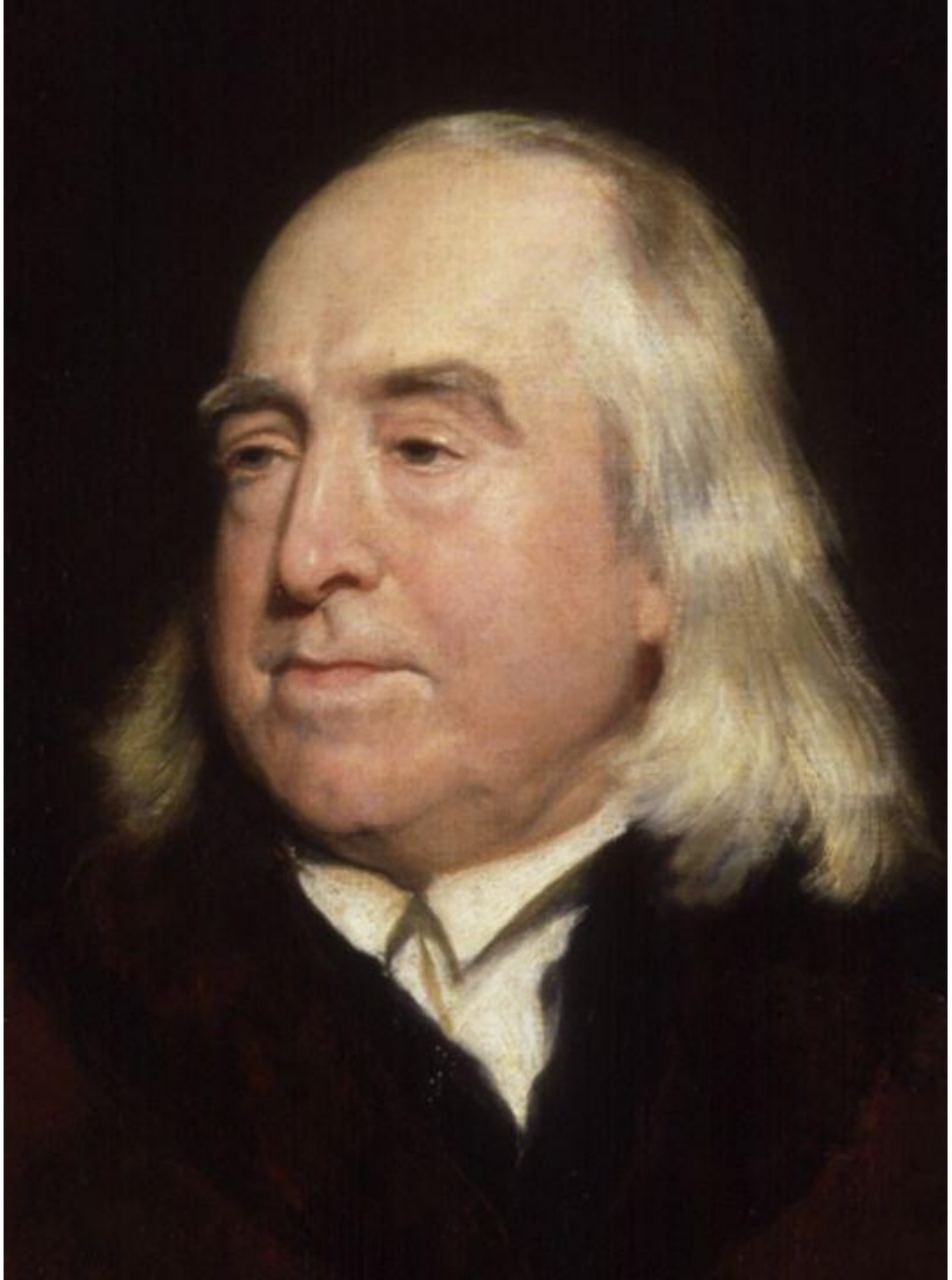
The economic, political, and social frameworks that each society has — its laws, institutions, policies, etc. — result in different distributions of benefits and burdens across members of the society… Principles of distributive justice… provid[e] moral guidance for the political processes and structures that affect the distribution of benefits and burdens in societies.

Stanford Encyclopedia of Philosophy
https://plato.stanford.edu/entries/justice-distributive/

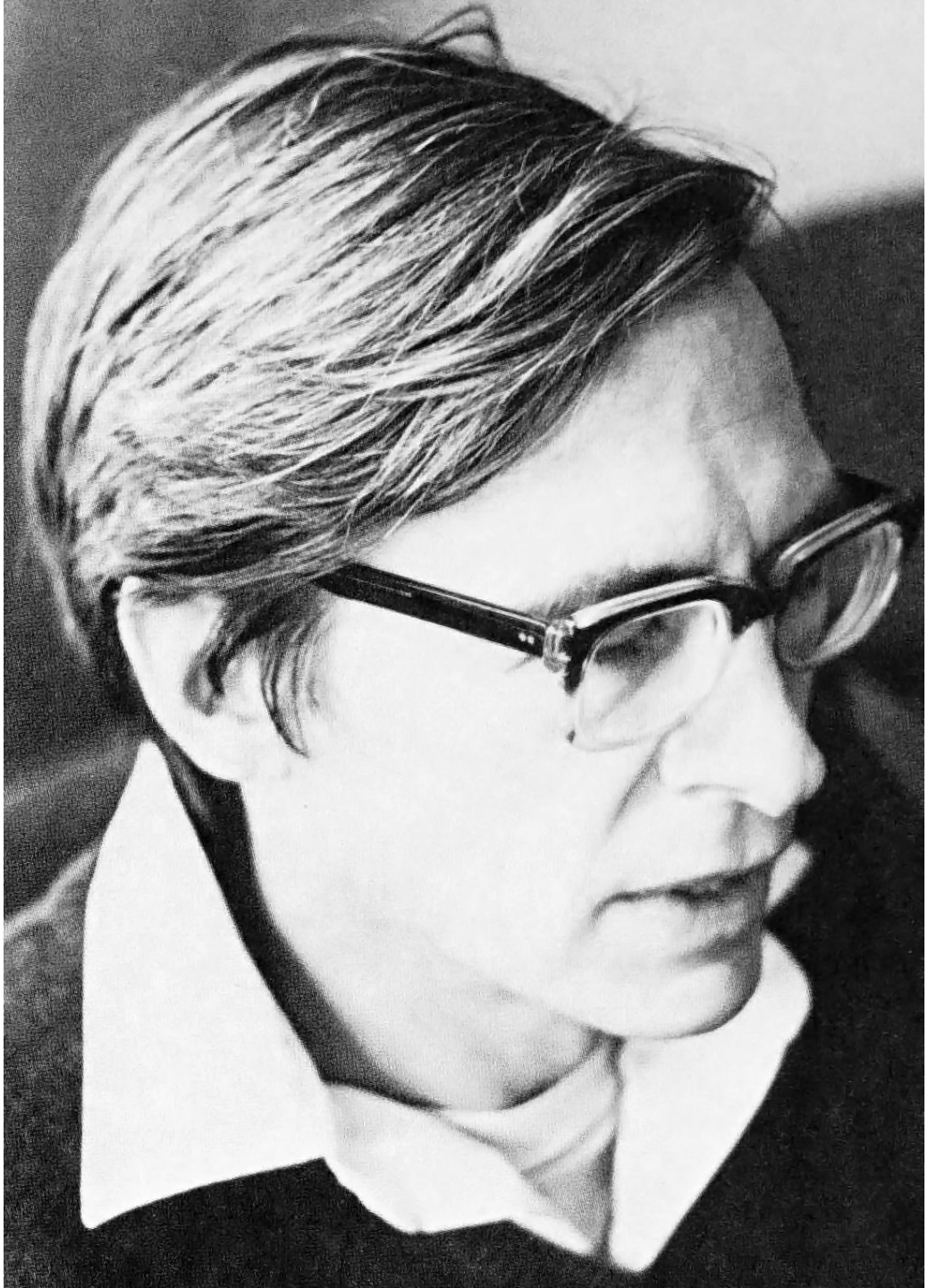
Strict egalitarianism
Luck egalitarianism

Consequentialism
Utilitarianism
Leveling down objection

Applications to technology?

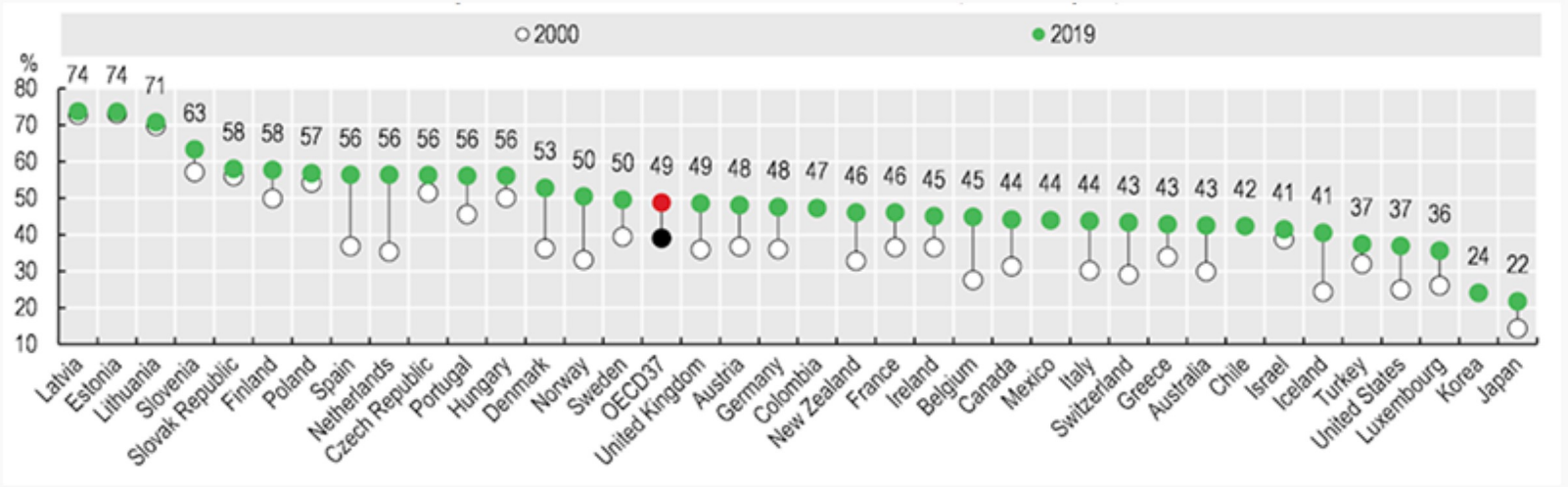


Wikipedia – Jeremy Bentham



Wikipedia – John Rawls

Share of female doctors, 2000 and 2019 (or nearest year)



Source: OECD (2021), Health at a Glance 2021: OECD Indicators, Doctors (by age, sex and category

The (Im)possibility of fairness

Individual fairness is the goal of giving similar individuals similar decisions.

Non-discrimination is the goal of giving similar groups on the whole similar decisions.

They are fundamentally incompatible!

Friedler et al. *Communications of the ACM*, 64(4)136-143, 2021.

Documenting Large Webtext Corpora: A Case Study on the Colossal Clean Crawled Corpus

Jesse Dodge, Maarten Sap, Ana Marasović, William Agnew, Gabriel Ilharco, Dirk Groeneveld, Margaret Mitchell, Matt Gardner

Abstract

Large language models have led to remarkable progress on many NLP tasks, and researchers are turning to ever-larger text corpora to train them. Some of the largest corpora available are made by scraping significant portions of the internet, and are frequently introduced with only minimal documentation. In this work we provide some of the first documentation for the Colossal Clean Crawled Corpus (C4; Raffel et al., 2020), a dataset created by applying a set of filters to a single snapshot of Common Crawl. We begin by investigating where the data came from, and find a significant amount of text from unexpected sources like patents and US military websites. Then we explore the content of the text itself, and find machine-generated text (e.g., from machine translation systems) and evaluation examples from other benchmark NLP datasets. To understand the impact of the filters applied to create this dataset, we evaluate the text that was removed, and show that blocklist filtering disproportionately removes text from and about minority individuals. Finally, we conclude with some recommendations for how to created and document web-scale datasets from a scrape of the internet.

PDF

Cite

Search

Video

Anthology ID: 2021.emnlp-main.98
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Venue: EMNLP
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Publisher: Association for Computational Linguistics
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Pages: 1286–1305
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Bibkey: `dodge-etal-2021-documenting`
Cite (ACL): Jesse Dodge, Maarten Sap, Ana Marasović, William Agnew, Gabriel Ilharco, Dirk Groeneveld, Margaret Mitchell, and Matt Gardner. 2021. Documenting Large Webtext Corpora: A Case Study on the Colossal Clean Crawled Corpus. In *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing*, pages 1286–1305, Online and Punta Cana, Dominican Republic. Association for Computational Linguistics.

End-To-End Arguments in System Design

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This paper presents a design principle that helps guide placement of functions among the modules of a distributed computer system. The principle, called the end-to-end argument, suggests that functions placed at low levels of a system may be redundant or of little value when compared with the cost of providing them at that low level. Examples discussed in the paper include bit-error recovery, security using encryption, duplicate message suppression, recovery from system crashes, and delivery acknowledgment. Low-level mechanisms to support these functions are justified only as performance enhancements.

CR Categories and Subject Descriptors: C.0 [**General**] Computer System Organization—*system architectures*; C.2.2 [**Computer-Communication Networks**]: Network Protocols—*protocol architecture*; C.2.4 [**Computer-Communication Networks**]: Distributed Systems; D.4.7 [**Operating Systems**]: Organization and Design—*distributed systems*

General Terms: Design

Additional Key Words and Phrases: Data communication, protocol design, design principles

1. INTRODUCTION

Choosing the proper boundaries between functions is perhaps the primary activity of the computer system designer. Design principles that provide guidance in this choice of function placement are among the most important tools of a system designer. This paper discusses one class of function placement argument that has been used for many years with neither explicit recognition nor much conviction. However, the emergence of the data communication network as a computer system component has sharpened this line of function placement argument by making more apparent the situations in which and the reasons why it applies. This paper articulates the argument explicitly, so as to examine its nature and to see how general it really is. The argument appeals to application requirements

The false hope of current approaches to explainable artificial intelligence in health care

Marzyeh Ghassemi, Luke Oakden-Rayner, Andrew L Beam

The black-box nature of current artificial intelligence (AI) has caused some to question whether AI must be explainable to be used in high-stakes scenarios such as medicine. It has been argued that explainable AI will engender trust with the health-care workforce, provide transparency into the AI decision making process, and potentially mitigate various kinds of bias. In this Viewpoint, we argue that this argument represents a false hope for explainable AI and that current explainability methods are unlikely to achieve these goals for patient-level decision support. We provide an overview of current explainability techniques and highlight how various failure cases can cause problems for decision making for individual patients. In the absence of suitable explainability methods, we advocate for rigorous internal and external validation of AI models as a more direct means of achieving the goals often associated with explainability, and we caution against having explainability be a requirement for clinically deployed models.

Lancet Digit Health 2021; 3: e745–50

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Introduction

Artificial intelligence (AI), powered by advances in machine learning, has made substantial progress across many areas of medicine in the past decade.[1–5] Given the increasing ubiquity of AI techniques, a new challenge for medical AI is its so-called black-box nature, with decisions that seem opaque and inscrutable. In response to the uneasiness of working with black boxes, there is a growing chorus of clinicians, lawmakers, and researchers calling for explainable AI models for high-risk areas such as health care.[6,7]

Although precise technical definitions of explainability lack consensus,[8,9] many high-level, less precise definitions have been put forth by various stakeholders. For example,

As such, we suggest that end users of explainable AI, including clinicians, lawmakers, and regulators, be aware of the limitations of explainable AI as it currently exists, especially as it relates to policy, use, and reporting. We argue that if the desire is to ensure that AI systems can operate safely and reliably, the focus should be on rigorous and thorough validation procedures.

Current approaches to explainable AI

Attempts to produce human-comprehensible explanations for machine learning decisions have typically been divided into two categories: inherent explainability and post-hoc explainability.

For machine learning models for which the input data

ECONOMIC POLICY

One big myth about medicine: We know how drugs work

By Carolyn Y. Johnson

July 23, 2015 at 2:00 p.m. EDT

(Patrick T. Fallon/Bloomberg)

Here's how we think we discover powerful new medicines: Scientists dig deep into biology and zero in on a molecular Achilles' heel that could

Category:Drugs with unknown mechanisms of action

From Wikipedia, the free encyclopedia

This is a category for drugs in which the specific mechanism of action relevant to therapeutic effects is unknown or unclear.

Subcategories

This category has only the following subcategory.

G

► General anesthetics (91 P)

Pages in category "Drugs with unknown mechanisms of action"

The following 71 pages are in this category, out of 71 total. This list may not reflect recent changes.

A

- Acamprosate
- Adrafinil
- Amixetrine
- Anagrelide
- Armodafinil
- Arsenamide
- Azacyclonol

B

- Bromantane
- Budipine

C

- Cetadiol
- Chlorphenesin carbamate
- CRL-40,940

- Fluoromedroxyprogesterone acetate

G

- General anaesthetic
- Glatiramer acetate
- Glufimet
- Guaifenesin

H

- Hydroxynorketamine

I

- Indapyrophenidone
- Iprindole

K

- Ketamine

L

N

- Nefopam
- Nemifitide
- Nimesulide
- NSI-189

O

- Olesoxime

P

- Paracetamol
- Phenazopyridine
- Pivagabine
- Pomalidomide
- Primodos
- Promoxolane

R

That’s all for this week!