永續數據分析
(Sustainability and ESG Data Analytics)

永續數據分析概論
(Introduction to Sustainability and ESG Data Analytics)

1122ESGDA01
DM4, NTPU (N4084) (Spring 2024)
Fri, 10, 11, 12 (18:30-21:15) (臺北大學民生校區 305)

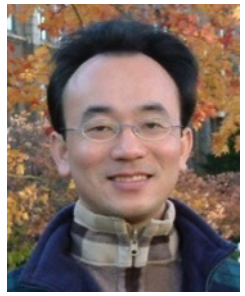
https://meet.google.com/miy-fbif-max

戴敏育
Min-Yuh Day, Ph.D,
Associate Professor

Institute of Information Management, National Taipei University

https://web.ntpu.edu.tw/~myday

2024-02-23



戴敏育

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Artificial Intelligence, Financial Technology, Big Data Analytics,
Data Mining and Text Mining, Electronic Commerce

國立臺北大學
National Taipei University

aws educate Cloud Ambassador
2020 Cohort

aws academy Accredited Educator

aws certified Solutions Architect Associate

aws certified Cloud Practitioner

Course Syllabus
National Taipei University
Academic Year 112, 2nd Semester (Spring 2024)

- **Course Title: 永續數據分析概論**
  (Introduction to Sustainability and ESG Data Analytics)
- **Instructor: 戴敏育 (Min-Yuh Day)**
- **Course Class: DM4, NTPU (3 Credits, Elective)**
- **Details**
  - **USR Course @ Digital Marketing**
    (3 Credits, Elective, One Semester) (N4084)
- **Time & Place: Fri, 10, 11, 12 (18:30-21:15) (民生校區305)**
- **Google Meet:** https://meet.google.com/miy-fbif-max

https://meet.google.com/miy-fbif-max

教學目標 (Course Objectives)

1. 瞭解永續數據分析基本概念。
2. 具備永續數據分析實務操作能力。
3. 整合大數據分析的創新思維，提升永續發展運作模式。
4. 在永續面向上，憑藉數據分析，研擬永續議題相關因應作為，並培養學生具有從資料中挖掘出具有管理意涵的數據分析基礎能力

Course Objectives

1. Understand the fundamental concepts of sustainability and ESG data analytics.
2. Equip with Hands-on practices of sustainability and ESG data analytics.
3. Integrate innovative thinking of big data analysis to enhance the operational model of sustainable development.
4. In the context of sustainability, use data analysis to formulate responses to sustainable issues and cultivate students' ability to extract management-relevant data analysis skills from the data.

課程包含永續發展(SDGs)目標

1. SDG4｜優質教育 (Quality Education)
2. SDG7｜可負擔的潔淨能源 (Affordable and Clean Energy)
3. SDG8｜尊嚴就業與經濟發展 (Decent Work and Economic Growth)
4. SDG9｜產業創新與基礎設施 (Industry, Innovation and Infrastructure)
5. SDG11｜永續城市與社區 (Sustainable Cities and Communities)
6. SDG12｜負責任的消費與生產 (Responsible Consumption and Production)
7. SDG13｜氣候行動 (Climate Action)
8. SDG17｜夥伴關係 (Partnerships for the Goals)

課程內容綱要 (Course Outline)

- 本課程介紹永續數據分析基本概念與實務操作。
- 課程內容包括
  1. 永續數據分析概論
  2. 環境、社會與治理 (ESG) 淨零數位轉型
  3. 永續與ESG 資料科學
  4. Web 3.0 和大數據分析在金融科技、綠色永續金融
  5. TCFD 氣候相關財務揭露與En-ROADS 氣候變遷模擬
  6. ESG數據的收集、分析和視覺化
  7. ESG數據報告、企業永續報告書
  8. ESG數據驗證
  9. 能源之星報告與數據揭露
  10. 人工智慧物聯網在ESG永續應用
  11. 生成性AI於永續評等和報告生成
  12. 永續數據分析個案研究

Course Outline

- This course introduces the fundamental concepts and hands-on practices of Sustainability and ESG Data Analytics.
- Topics include
  1. Introduction Sustainability and ESG Data Analytics
  2. Environmental, Social, and Governance (ESG) in Net-Zero Digital Transformation
  3. Data Science for Sustainability and ESG
  4. Web 3.0 and Big Data Analysis in Fintech, Green Finance, Sustainable Finance
  5. Task Force on Climate-Related Financial Disclosures (TCFD) and En-Roads Interactive
  6. ESG Data Gathering, Analysis, and Visualization
  7. ESG Data Reporting, Corporate Sustainability Reports
  8. ESG Data Verification
  9. Energy Star Reporting and Data Disclosure
  10. Artificial Intelligence of things (AIoT) in ESG and Sustainability Applications
  11. Generative AI for ESG Rating and Reporting Generation
  12. Case Study on Sustainability and ESG Data Analytics

課程大綱 (Syllabus)

週次 (Week)　日期 (Date)　內容 (Subject/Topics)

1 2024/02/23 永續數據分析概論
(Introduction Sustainability and ESG Data Analytics)

2 2024/03/01 環境、社會與治理 (ESG) 淨零數位轉型
(Environmental, Social, and Governance (ESG) in Net-Zero Digital Transformation)

3 2024/03/08 永續與ESG 資料科學
(Data Science for Sustainability and ESG)

4 2024/03/15 永續數據分析個案研究 I
(Case Study on Sustainability and ESG Data Analytics I)

5 2024/03/22 Web 3.0 和大數據分析在金融科技、綠色永續金融
(Web 3.0 and Big Data Analysis in Fintech, Green and Sustainable Finance)

課程大綱 (Syllabus)

週次 (Week)　日期 (Date)　內容 (Subject/Topics)

6 2024/03/29 TCFD 氣候相關財務揭露與En-ROADS 氣候變遷模擬
(Task Force on Climate-Related Financial Disclosures (TCFD) and En-Roads Interactive)

7 2024/04/05 放假 (No Classes)

8 2024/04/12 期中報告 (Midterm Project Report)

9 2024/04/19 ESG數據的收集、分析和視覺化
(ESG Data Gathering, Analysis, and Visualization)

10 2024/04/26 ESG數據報告 (ESG Data Reporting);
企業永續報告書 (Corporate Sustainability Reports)

課程大綱 (Syllabus)

週次 (Week)　日期 (Date)　內容 (Subject/Topics)

11 2024/05/03 ESG數據驗證 (ESG Data Verification)

12 2024/05/10 永續數據分析個案研究 II
(Case Study on Sustainability and ESG Data Analytics II)

13 2024/05/17 能源之星報告與數據揭露
(Energy Star Reporting and Data Disclosure)

14 2024/05/24 人工智慧物聯網在ESG永續應用
(Artificial Intelligence of things (AIoT) in ESG and Sustainability Applications)

15 2024/05/31 生成式AI於永續評等和報告生成
(Generative AI for ESG Rating and Reporting Generation)

16 2024/06/07 期末報告 (Final Project Report)

課程與教學特色

1. 結合 Web3.0介紹大數據分析基本概念、研究議題與實務操作。
2. 提供數據整合溝通企劃的理論與實務概念及工具。
3. 應用於分析各領域的資料，並透過資料視覺化的方式呈現分析結果。

預期社會影響：

1. 由數據分析學習，培養面對永續議題與風險時，因應作為分析能力。
2. 培養具備大數據分析基本概念、研究議題、實務操作以及永續數據分析實作能力的人才。

Course and Teaching Features

1. Combine Web3.0 to introduce basic concepts of big data analysis, research topics, and practical operations.
2. Provide theories and tools for data integration and communication planning.
3. Apply to analyze data from various domains and present analysis results through data visualization.

Expected Social Impact:

1. Learn from data analysis, cultivating the ability to analyze responses when facing sustainable issues and risks.
2. Train talents who possess basic concepts of big data analysis, research topics, practical operations, and practical abilities in sustainable data analysis.

教學策略創新

1. USR（大學社會責任）在地連結、合作
2. 小組學習
3. 問題取向教學
4. 主題教學
5. 學思達教學

校四大基本素養
(Four Fundamental Qualities)

1. 專業 (Professionalism)
2. 人際 (Interpersonal Relationship)
3. 倫理 (Ethics)
4. 國際觀 (International Vision)

商學院學習目標
(College Learning Goals)

1. Communication
2. Analytical and Critical Thinking
3. Ethics/Corporate Social Responsibility
4. Global Knowledge/Awareness

數位行銷進修學士學位學程
系核心能力

1. 具有判斷商業問題並有系統地解決這些問題 40 %
2. 能展現商業教育所需的基本技能 40 %
3. 具有溝通能力 10 %
4. 能意識道德問題及其影響 5 %
5. 透過參與相關活動了解國際議題 5 %

教學方法與教學活動
(Teaching Methods and Activities)

- 講授 (Lecture)
- 討論 (Discussion)
- 實習 (Practicum)

評量方式 (Evaluation Methods)

- 個人報告 (Individual Presentation) 30 %
- 團體報告(Group Presentation) 30 %
- 個案分析報告 (Case Report) 20 %
- 課堂參與 (Class Participation) 10 %
- 作業 (Assignment) 10 %

指定用書 (Required Texts)

- **Cino Robin Castelli, Cyril Shmatov (2022), Quantitative Methods for ESG Finance, Wiley**

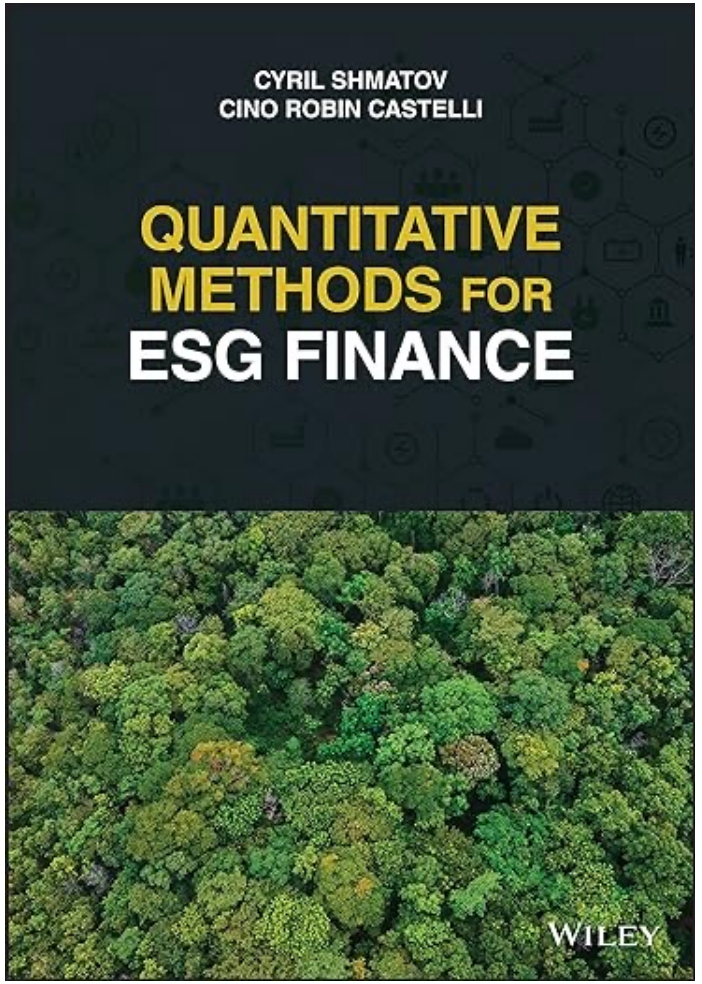
參考書目 (Reference Books)

1. Simon Thompson (2023), Green and Sustainable Finance: Principles and Practice in Banking, Investment and Insurance, 2nd Edition, Kogan Page.
2. Chrissa Pagitsas (2023), Chief Sustainability Officers At Work: How CSOs Build Successful Sustainability and ESG Strategies, Apress.
3. Hariom Tatsat, Sahil Puri, Brad Lookabaugh (2020), Machine Learning and Data Science Blueprints for Finance: From Building Trading Strategies to Robo-Advisors Using Python, O'Reilly Media
4. Aurélien Géron (2022), Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 3rd Edition, O'Reilly Media.
5. Chris Kelliher (2022), Quantitative Finance With Python: A Practical Guide to Investment Management, Trading, and Financial Engineering, Chapman and Hall/CRC.
6. Yves Hilpisch (2020), Artificial Intelligence in Finance: A Python-Based Guide, O'Reilly Media.
7. Abdullah Karasan (2021), Machine Learning for Financial Risk Management with Python: Algorithms for Modeling Risk, O'Reilly Media.
8. Yves Hilpisch (2018), Python for Finance: Mastering Data-Driven Finance, 2nd Edition, O'Reilly Media.

其他參考資料 (Other References)

1. GRI (Global Report Initiative): https://www.globalreporting.org/
2. CDP (Carbon Disclosure Project): https://www.cdp.net/
3. SASB (Sustainability Accounting Standards Board): https://sasb.org/
4. ISSB (International Sustainability Standards Board): https://www.ifrs.org/groups/international-sustainability-standards-board/
5. TCFD (Task Force on Climate-related Financial Disclosures): https://www.fsb-tcfd.org/
6. Research Papers

Cino Robin Castelli, Cyril Shmatov (2022), Quantitative Methods for ESG Finance, Wiley

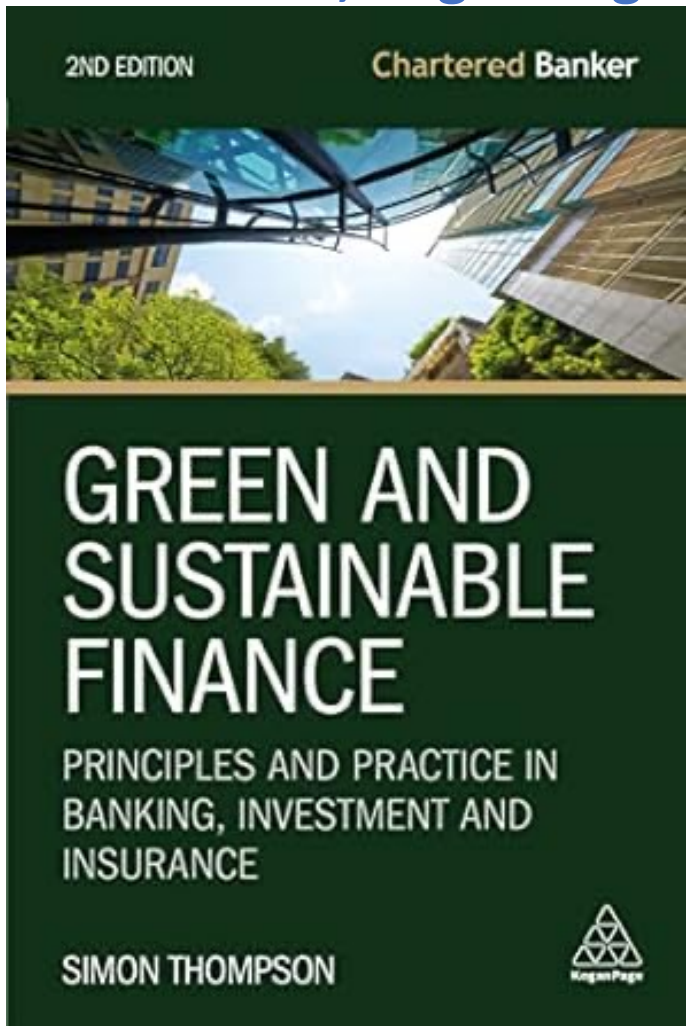


Source: https://www.amazon.com/Quantitative-Methods-Finance-Robin-Castelli/dp/1119903807/

Simon Thompson (2023),

Green and Sustainable Finance:

Principles and Practice in Banking, Investment and Insurance, 2nd Edition, Kogan Page.



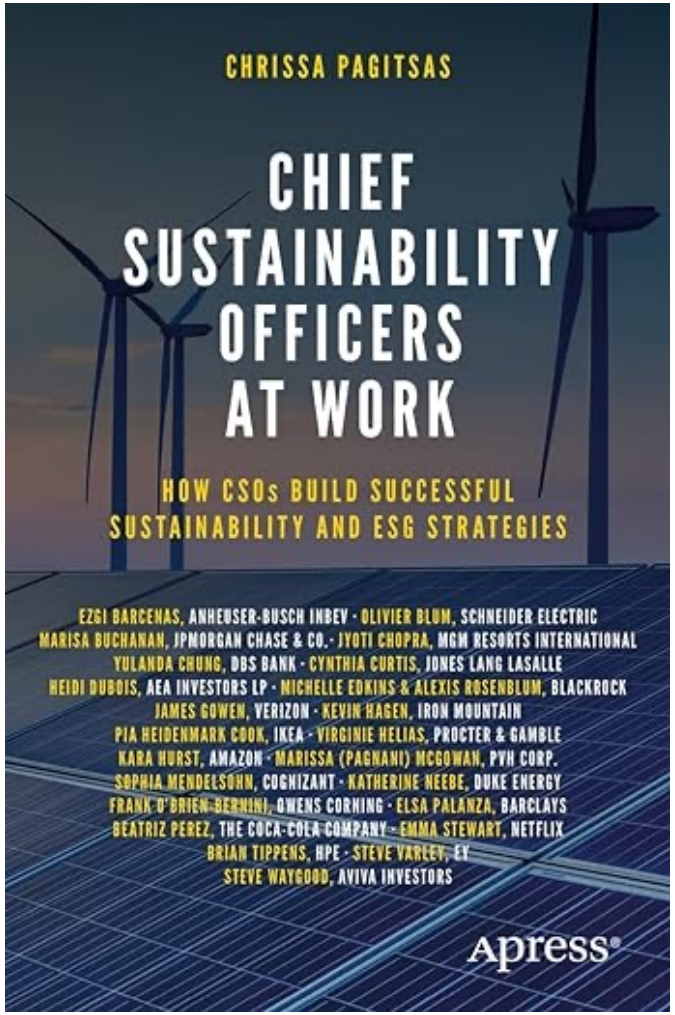
Source: https://www.amazon.com/Green-Sustainable-Finance-Principles-Investment/dp/1398609242/

Chrissa Pagitsas (2023),

Chief Sustainability Officers At Work:

How CSOs Build Successful Sustainability and ESG Strategies,

Apress.



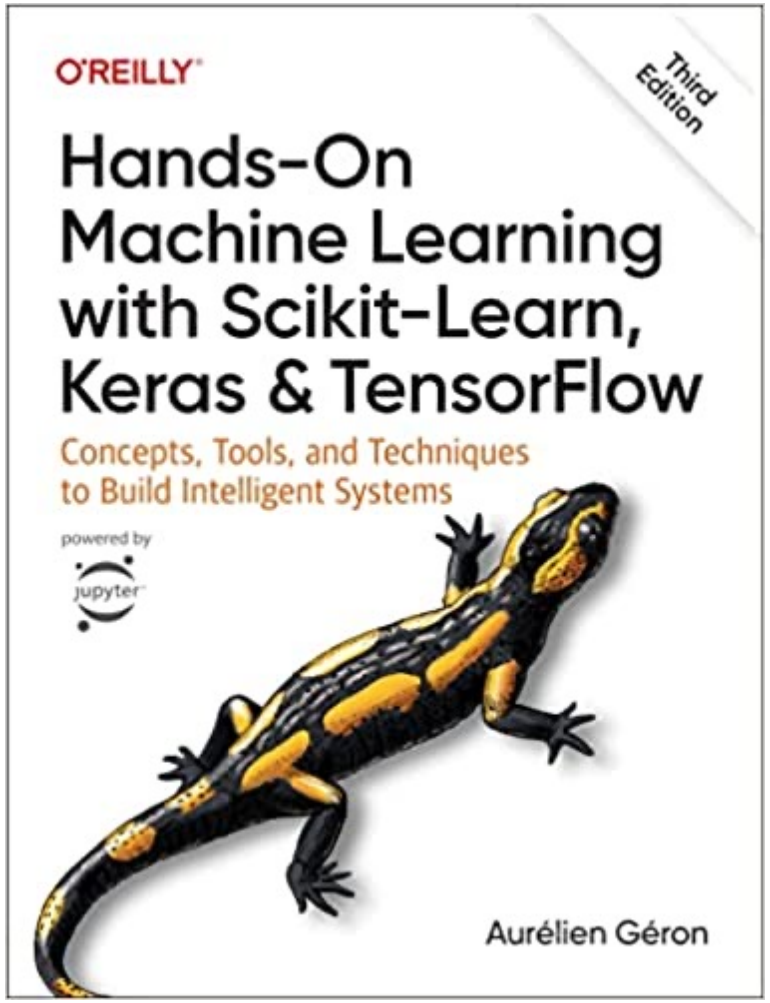
Source: https://www.amazon.com/Chief-Sustainability-Officers-Work-Successful/dp/1484278658/

Aurélien Géron (2022),

Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow:

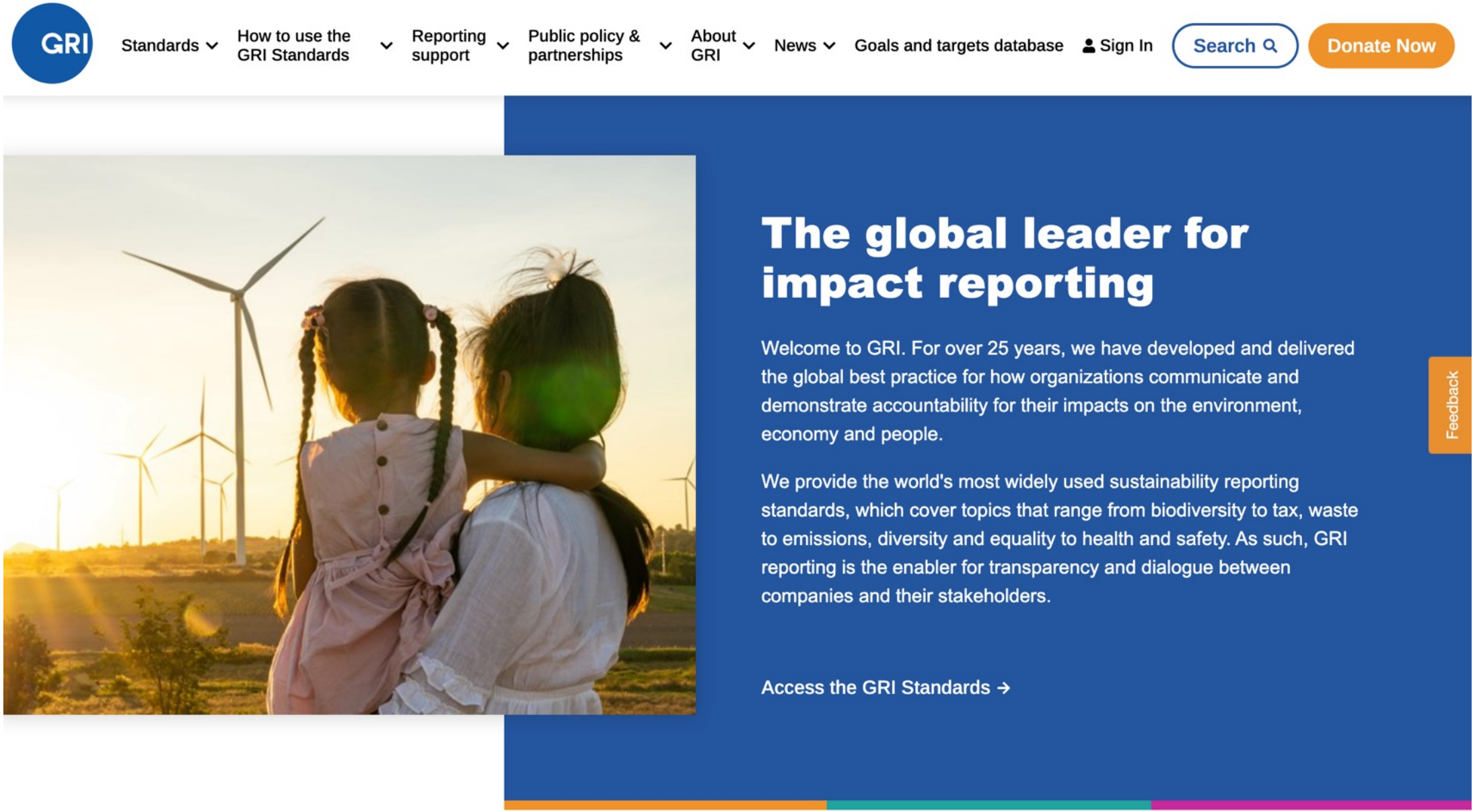
Concepts, Tools, and Techniques to Build Intelligent Systems,

3rd Edition, O'Reilly Media.



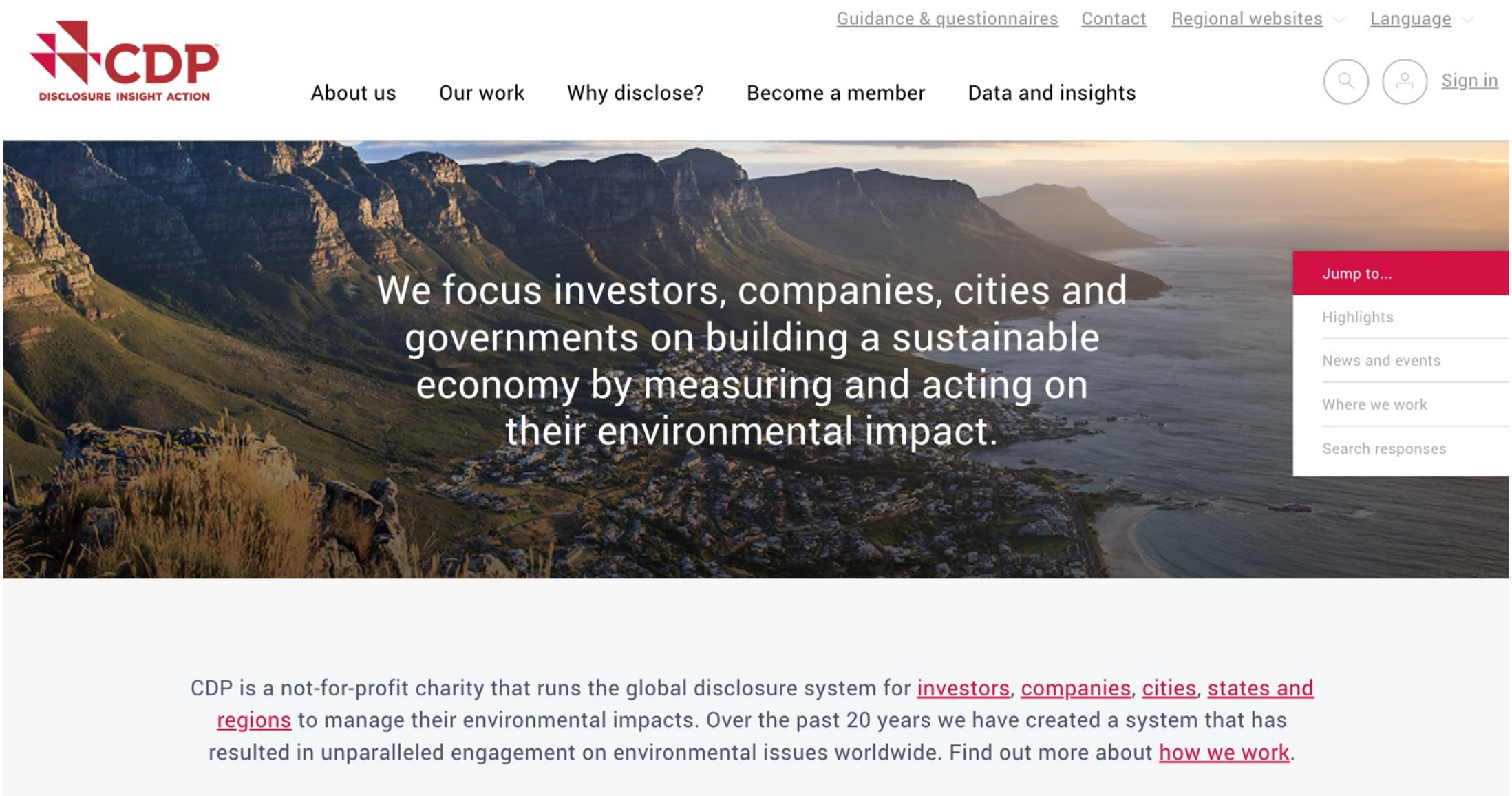
Source: https://www.amazon.com/Hands-Machine-Learning-Scikit-Learn-TensorFlow/dp/1098125975

GRI (Global Report Initiative)



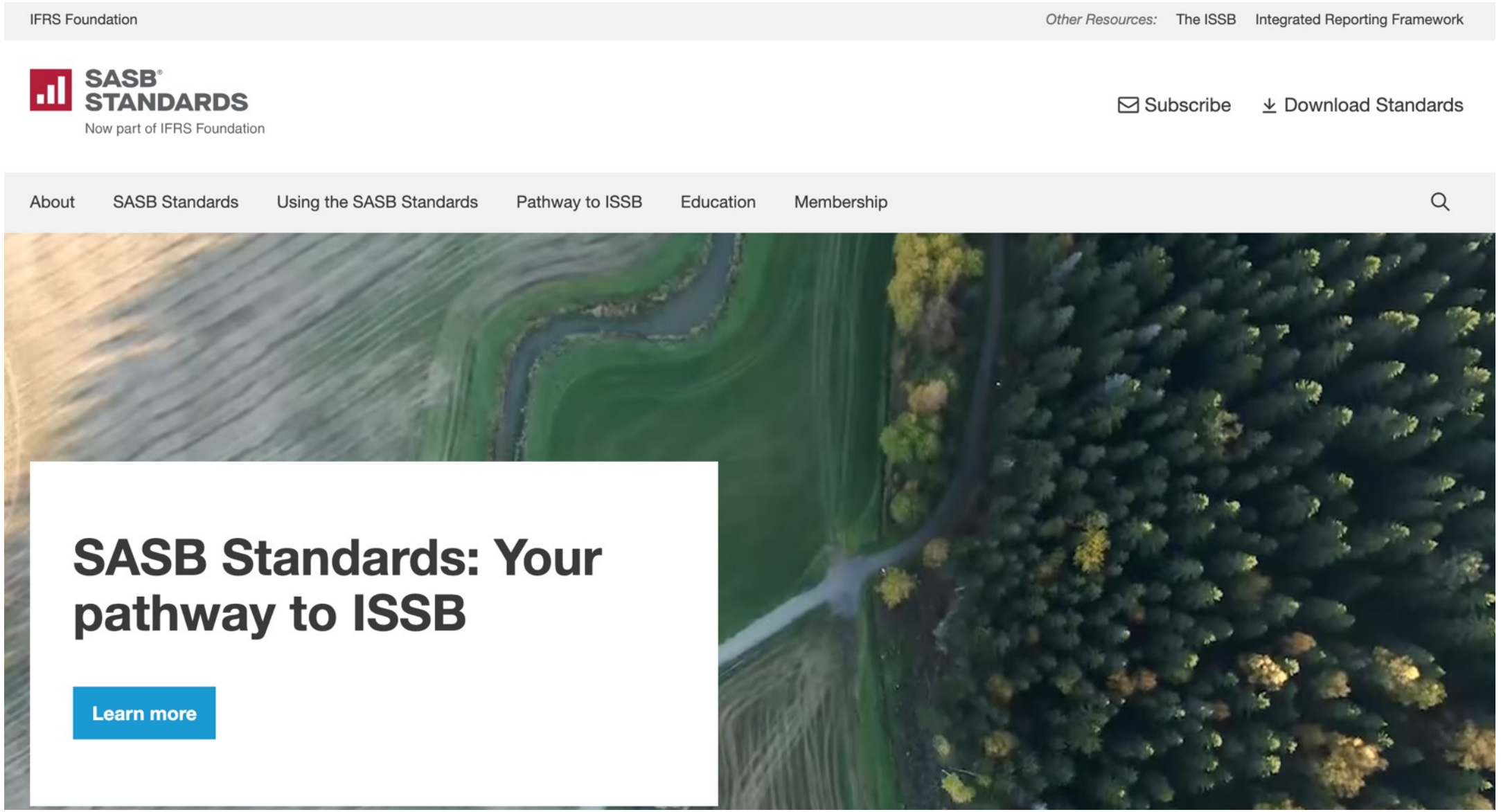
https://www.globalreporting.org/

CDP (Carbon Disclosure Project)



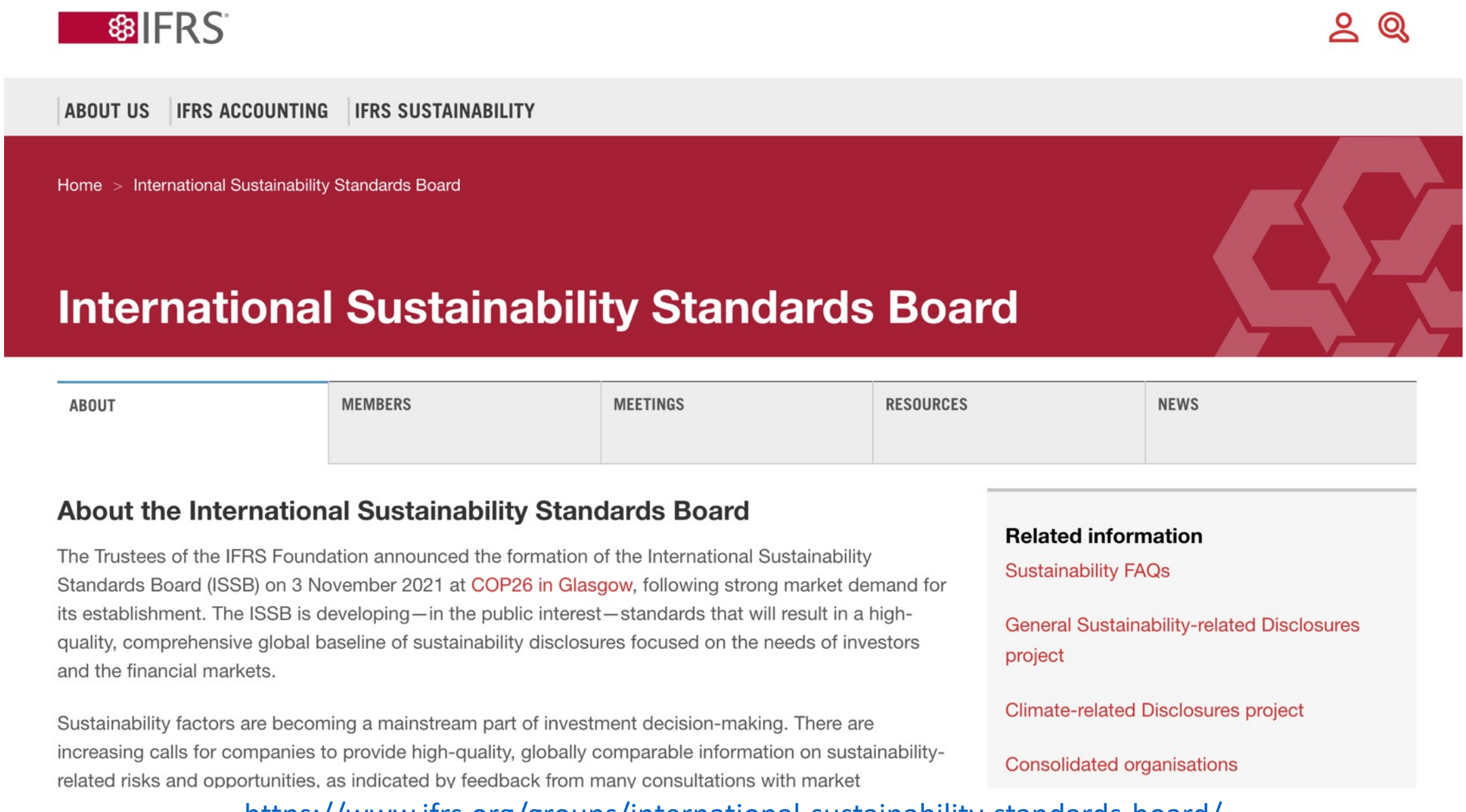
https://www.cdp.net/

SASB (Sustainability Accounting Standards Board)



https://sasb.org/

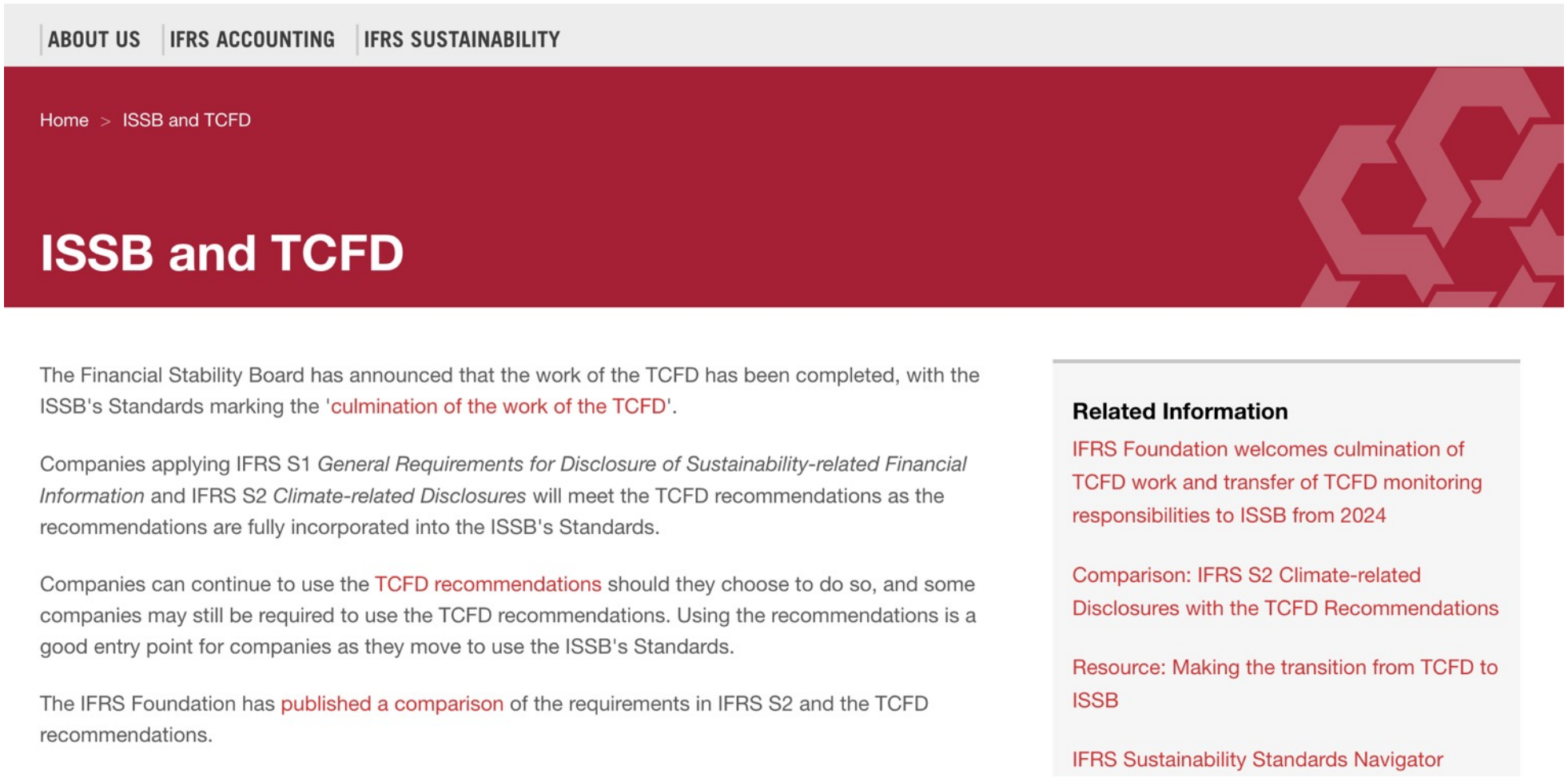
ISSB (International Sustainability Standards Board)



https://www.ifrs.org/groups/international-sustainability-standards-board/

TCFD
(Task Force on Climate-related Financial Disclosures)

https://www.ifrs.org/sustainability/tcfd/



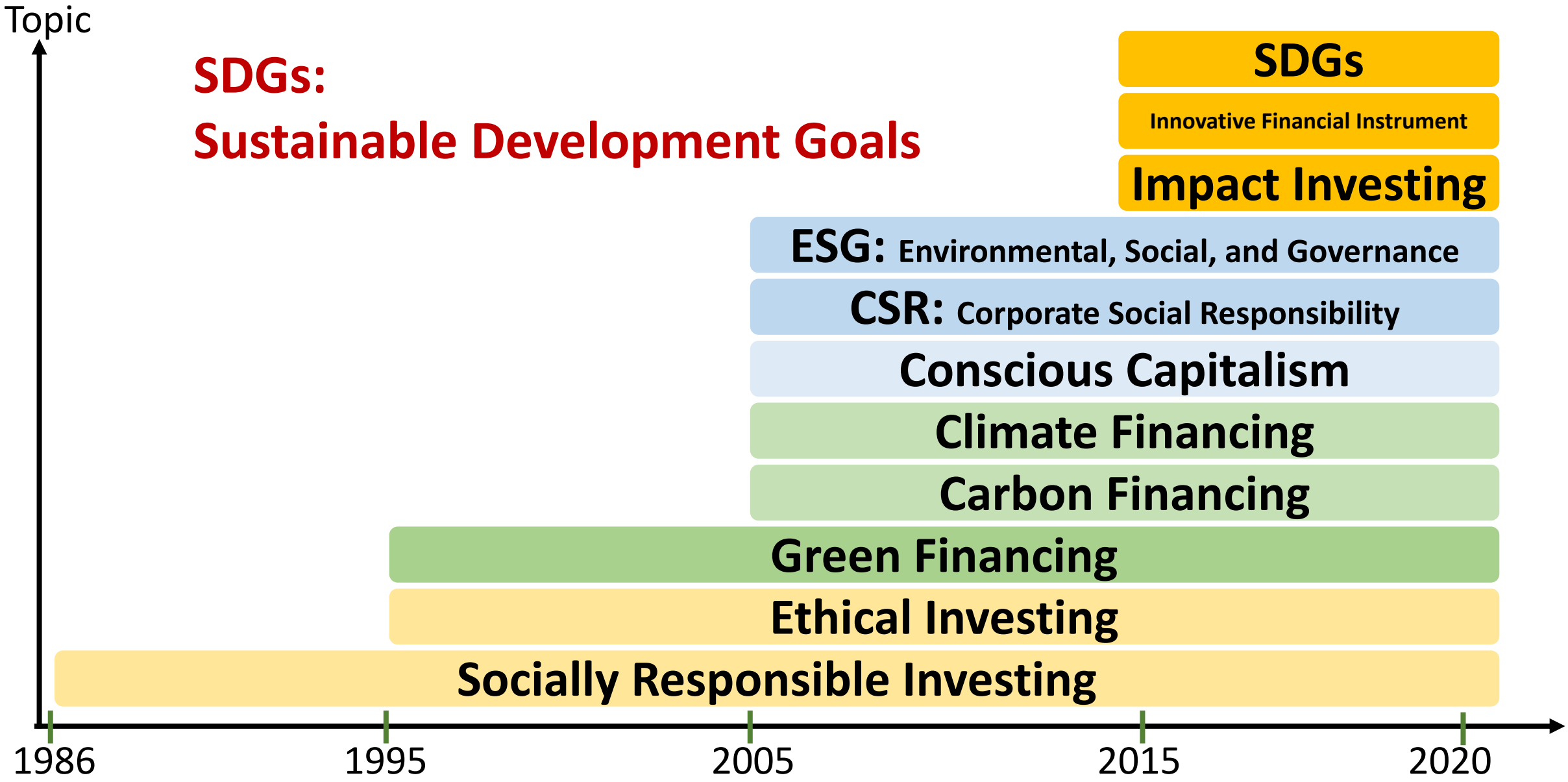
https://www.fsb-tcfd.org/

Sustainability
and
ESG Data Analytics

Sustainable Development Goals (SDGs)

Source: https://sdgs.un.org/goals

Evolution of Sustainable Finance Research



Source: Kumar, S., Sharma, D., Rao, S., Lim, W. M., & Mangla, S. K. (2022). Past, present, and future of sustainable finance: Insights from big data analytics through machine learning of scholarly research. Annals of Operations Research, 1-44.

Sustainable Development Goals (SDGs) and 5P

Partnership

Peace

Prosperity

People

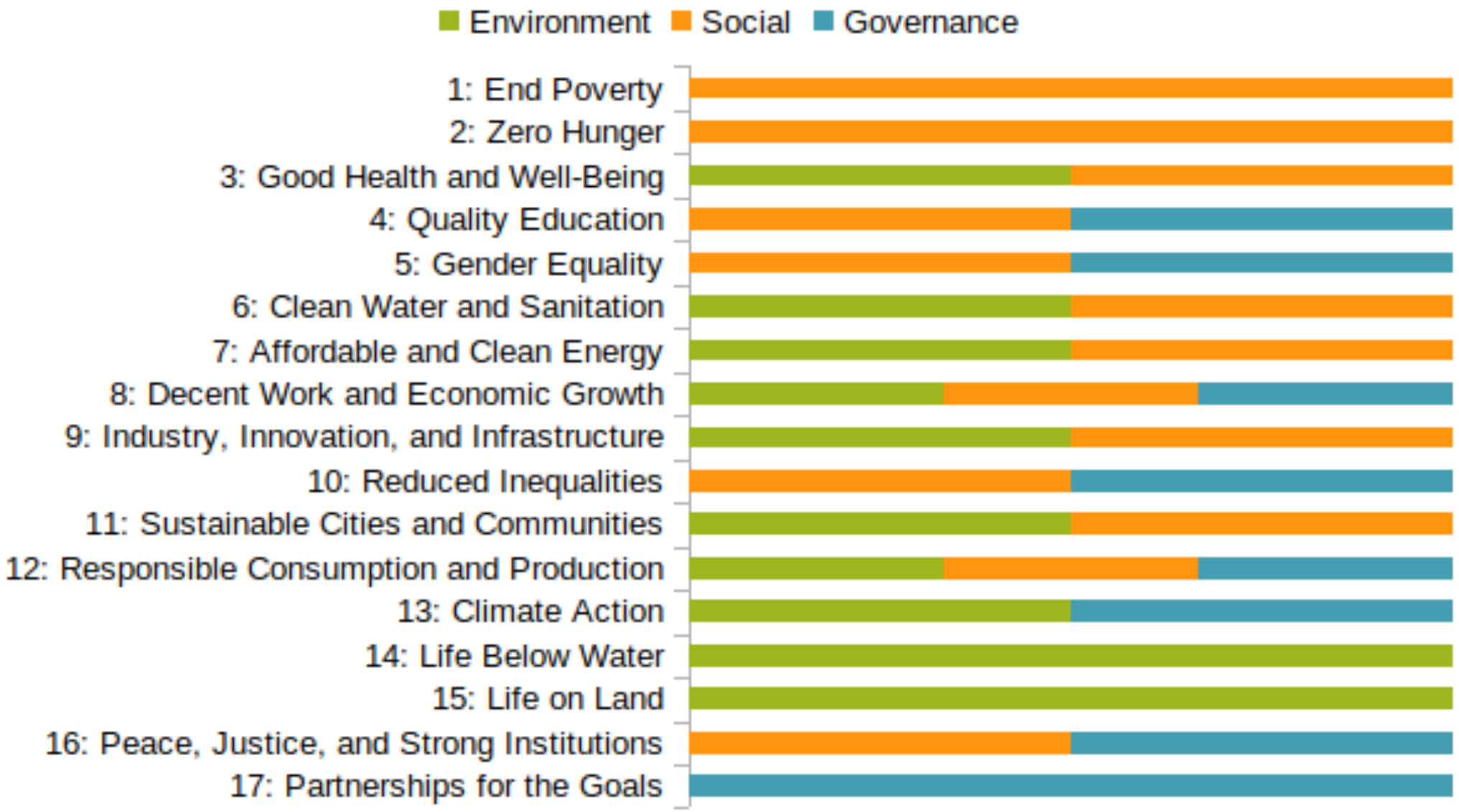
Planet

Source: Folke, Carl, Reinette Biggs, Albert V. Norström, Belinda Reyers, and Johan Rockström. "Social-ecological resilience and biosphere-based sustainability science."Ecology and Society 21, no. 3 (2016).

ESG to 17 SDGs

Source: Henrik Skaug Sætra (2021) "A Framework for Evaluating and Disclosing the ESG Related Impacts of AI with the SDGs." Sustainability 13, no. 15 (2021): 8503.

ESG to 17 SDGs



Source: https://sustainometric.com/esg-to-sdgs-connected-paths-to-a-sustainable-future/

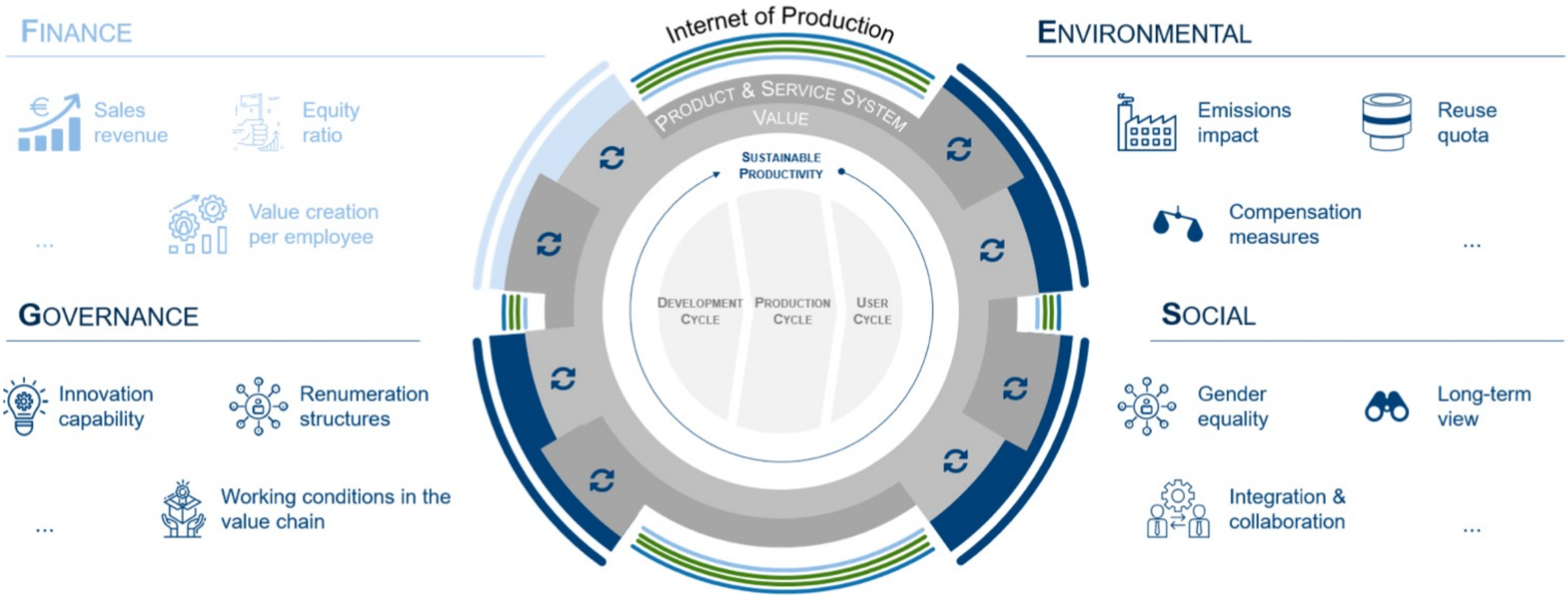
Generative AI for ESG Applications

Sustainable Productivity: Finance ESG

FINANCE	Financial result / Financial expense		Return on sales, profit, return on equity, ...
ENVIRONMENT	Positive environmental contribution / Environmental impact		Management of energy, waste, pollution water, ...
SOCIAL	Positive social contribution / Social burden		Equal opportunity, collaboration & safety, ...
GOVERNANCE	Positive governance contribution / Governance expense		Compliance, shareholder structure, innovation contribution, ...

Source: Huang, Ziqi, Yang Shen, Jiayi Li, Marcel Fey, and Christian Brecher (2021). "A survey on AI-driven digital twins in Industry 4.0: Smart manufacturing and advanced robotics." Sensors 21, no. 19: 6340.

Sustainable Resilient Manufacturing
ESG

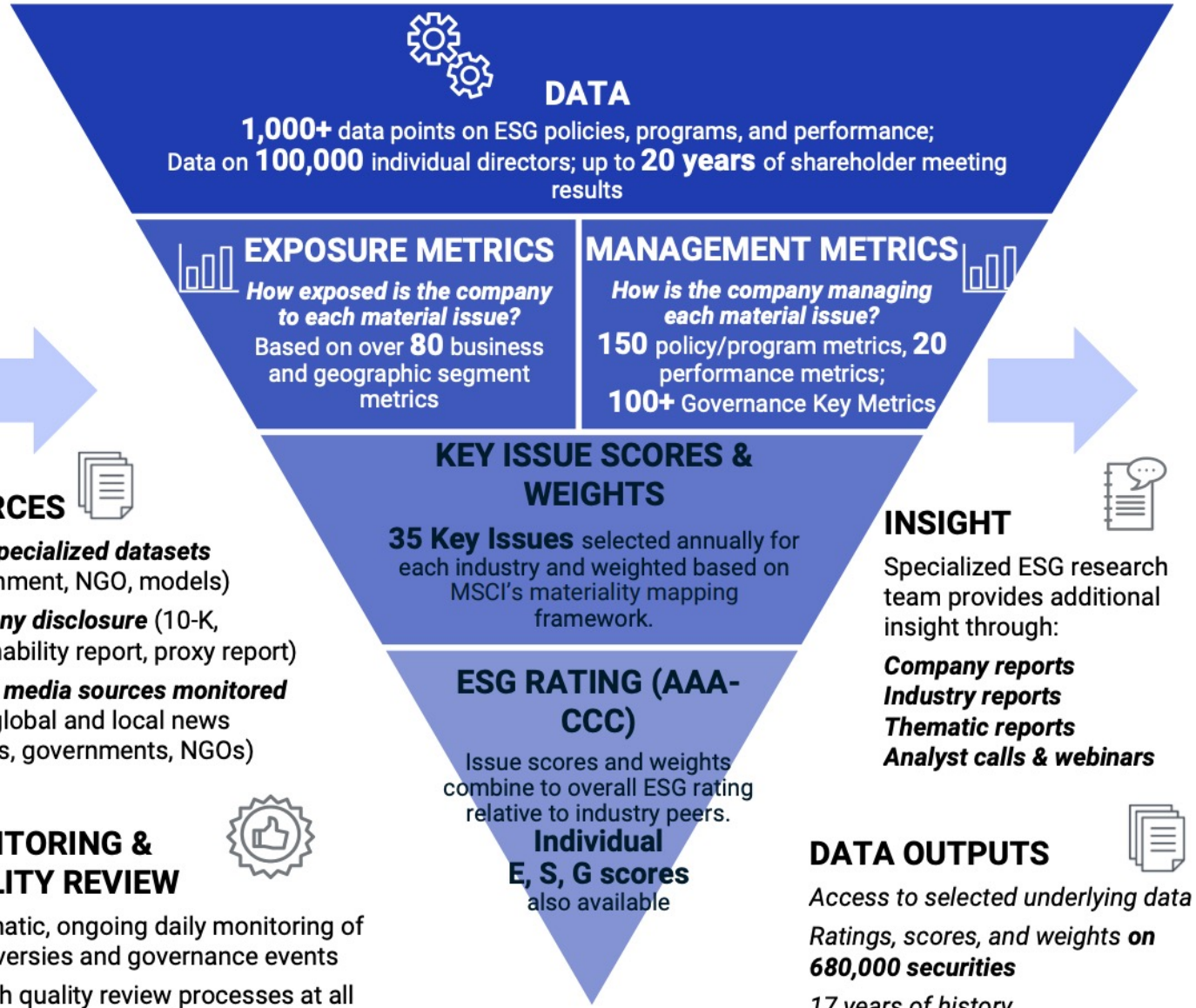


Source: Huang, Ziqi, Yang Shen, Jiayi Li, Marcel Fey, and Christian Brecher (2021). "A survey on AI-driven digital twins in Industry 4.0: Smart manufacturing and advanced robotics." Sensors 21, no. 19: 6340.

ESG Indexes

- MSCI ESG Index
- Dow Jones Sustainability Indices (DJSI)
- FTSE ESG Index

MSCI ESG Rating Framework



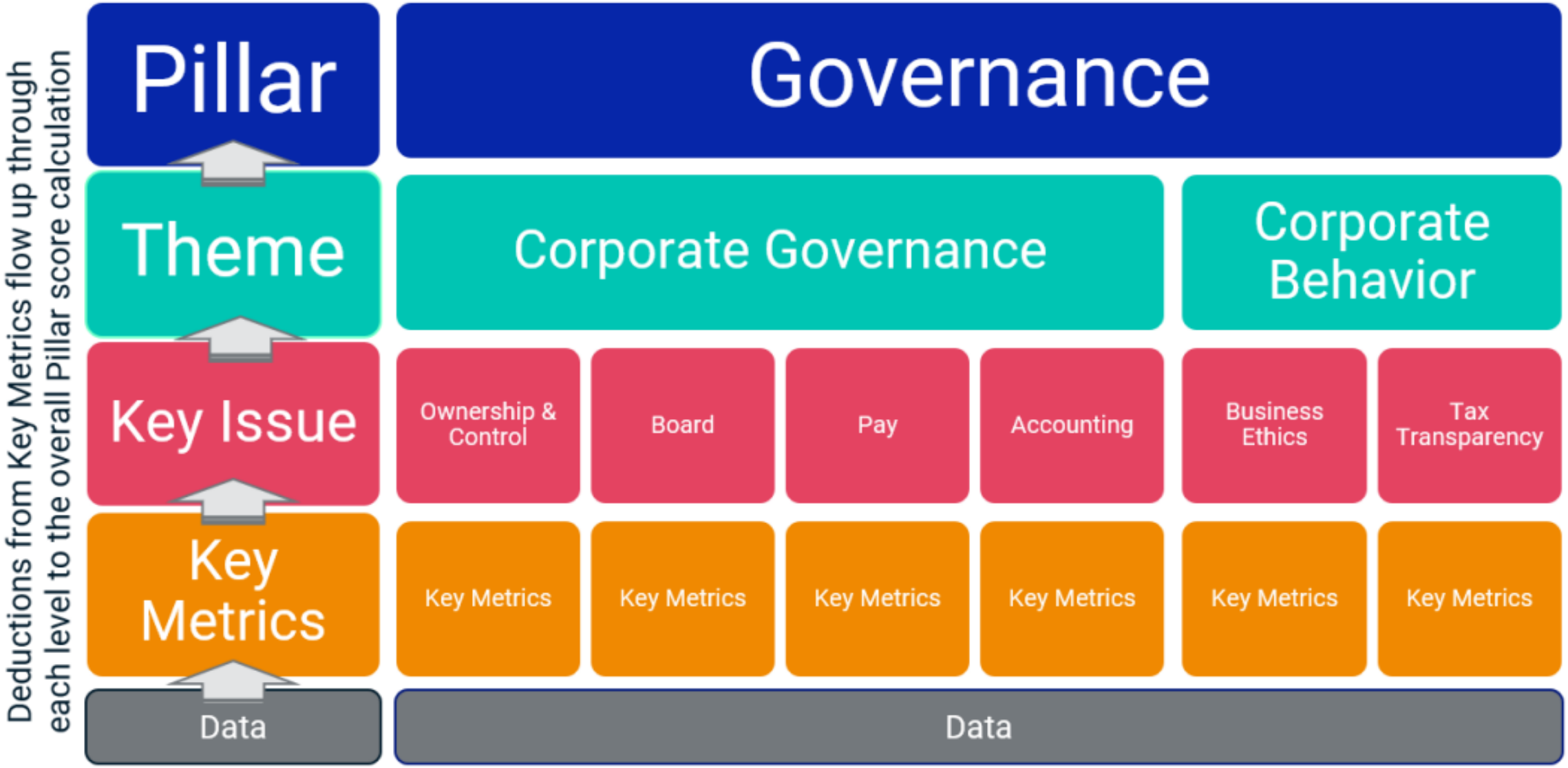
Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

MSCI ESG Key Issue Hierarchy

3 Pillars	10 Themes	35 ESG Key Issues	
Environment	**Climate Change**	Carbon Emissions	Financing Environmental Impact
		Product Carbon Footprint	Climate Change Vulnerability
	Natural Capital	Water Stress	Raw Material Sourcing
		Biodiversity & Land Use	
	Pollution & Waste	Toxic Emissions & Waste	Electronic Waste
		Packaging Material & Waste	
	Environmental Opportunities	Opportunities in Clean Tech	Opportunities in Renewable Energy
		Opportunities in Green Building	
Social	**Human Capital**	Labor Management	Human Capital Development
		Health & Safety	Supply Chain Labor Standards
	Product Liability	Product Safety & Quality	Privacy & Data Security
		Chemical Safety	Responsible Investment
		Consumer Financial Protection	Health & Demographic Risk
	Stakeholder Opposition	Controversial Sourcing	
		Community Relations	
	Social Opportunities	Access to Communications	Access to Health Care
		Access to Finance	Opportunities in Nutrition & Health
Governance	**Corporate Governance**	Ownership & Control	Pay
		Board	Accounting
	Corporate Behavior	Business Ethics	
		Tax Transparency	

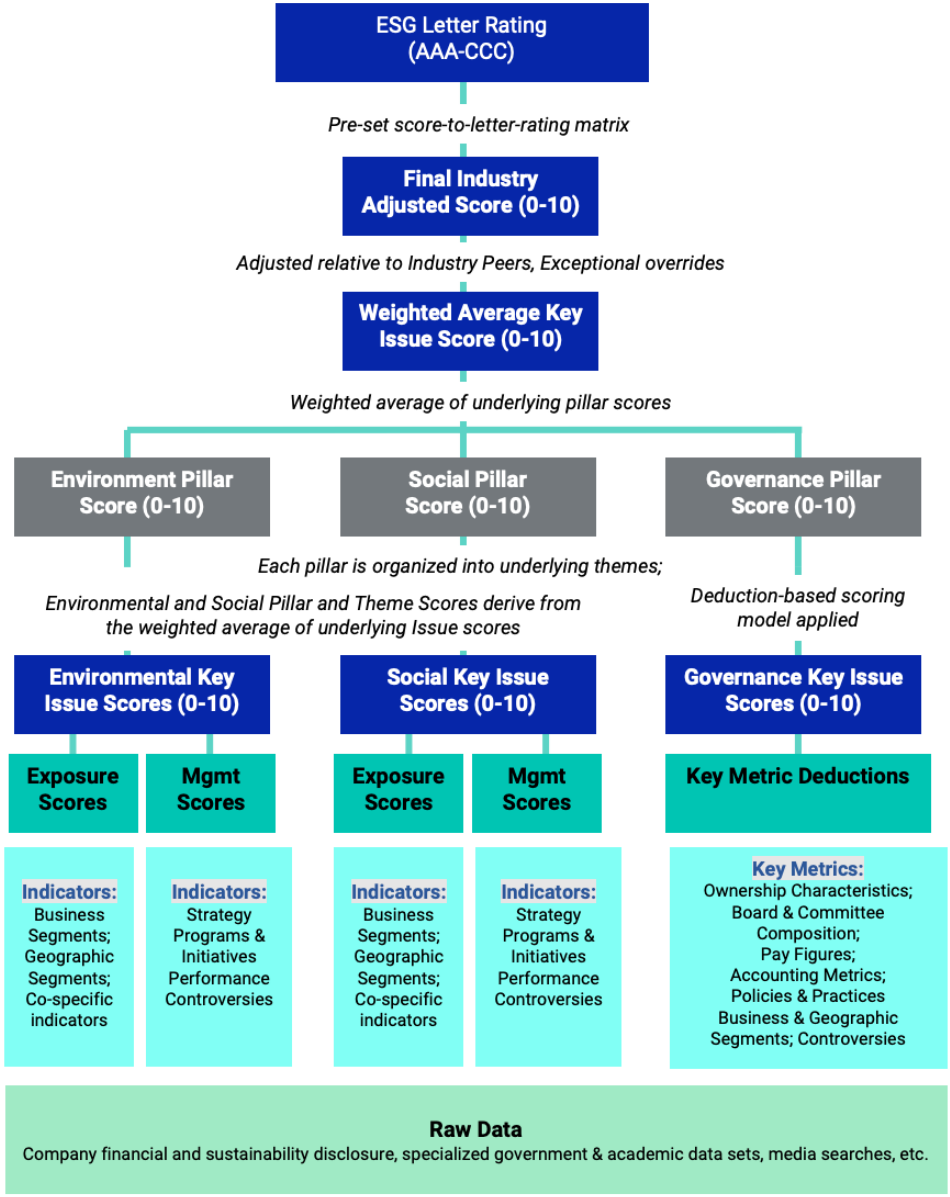
Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

MSCI Governance Model Structure



Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

MSCI Hierarchy of ESG Scores



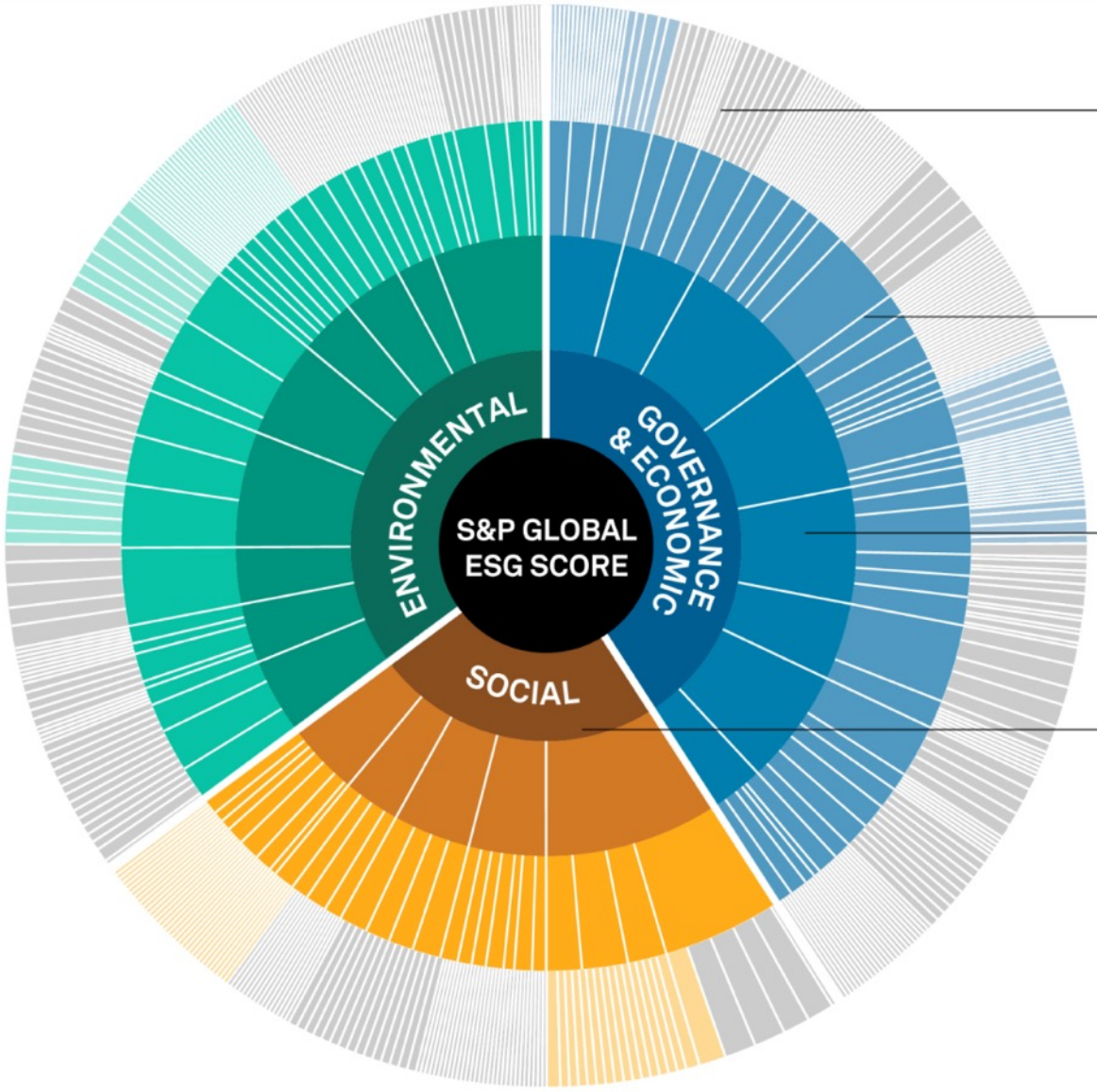
Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

DJSI S&P Global ESG Score

8,000
Companies

90%
Global market capitalization

340,000+
Current Research Universe and Active Securities



Approx.
1,000
Datapoints

Assessed values, text, checkboxes, documents
Sources: Web-based questionnaire and company documents

130+
Questions

Weighted data point scores
Up to 50% industry-specific

Ave.
30+
Criteria scores

Weighted question scores
61 industry specific approaches, with tailored questions, criteria and related weightings

3
Dimension scores

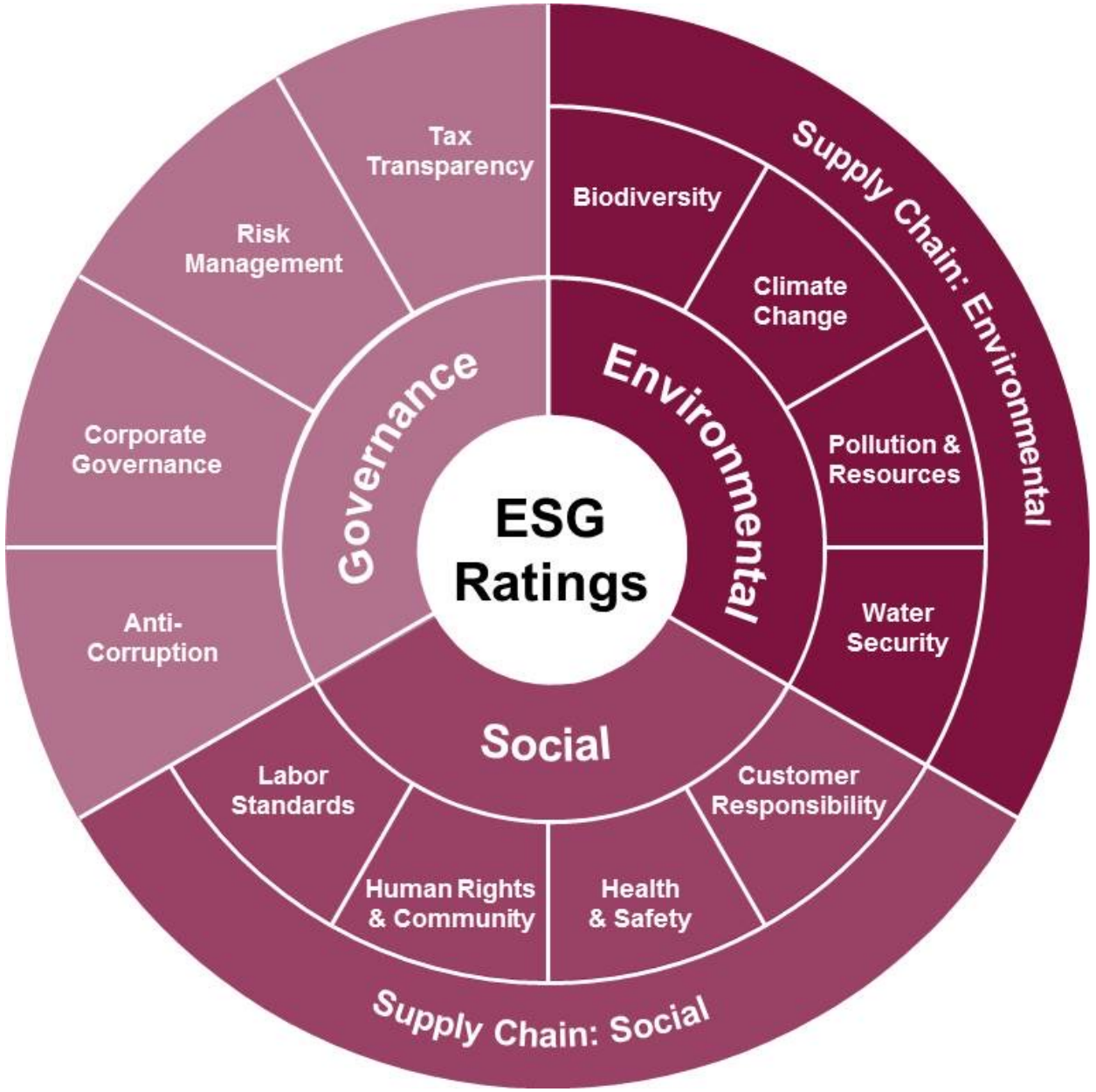
Weighted criteria scores
Adjusted for corporate ESG controversies where applicable

1
S&P Global ESG Score

Sum of weighted dimension scores

Source: DJSI, S&P Global Corporate Sustainability Assessment (CSA), https://www.spglobal.com/esg/solutions/data-intelligence-esg-scores

FTSE Russell ESG Ratings



Source: https://www.ftserussell.com/data/sustainability-and-esg-data/esg-ratings

SUSTAINALYTICS
a Morningstar company

Sustainalytics ESG Risk Ratings

Analyst-based approach

Sustainalytics' ESG Risk Ratings measure a company's exposure to industry-specific material ESG risks and how well a company is managing those risks.

Negligible	Low	Medium	High	Severe
0 - 10	10 - 20	20 - 30	30 - 40	40+

Source: https://www.sustainalytics.com/esg-data

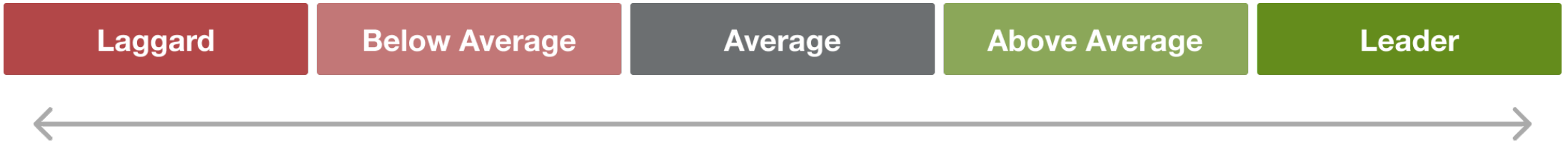
TruValue Labs

FACTSET

Truvalue ESG Ranks

Machine-based approach

- **Truvalue Labs applies AI to analyze over 100,000 sources and uncover ESG risks and opportunities hidden in unstructured text.**
- **The ESG Ranks data service produces an overall company rank based on industry percentile leveraging the 26 ESG categories defined by the Sustainability Accounting Standards Board (SASB).**
- **The data feed covers 20,000+ companies with more than 13 years of history.**



Source: :https://developer.truvaluelabs.com/data/esg-ranks

Analyst-driven vs. AI-driven ESG

Analyst-driven ESG research

Derives ratings in a structured data model

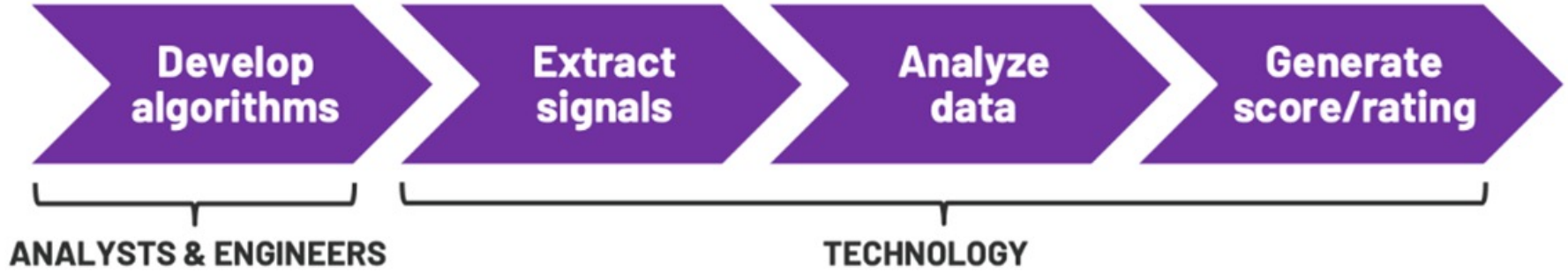
Sustainalytics

Analyst role at the end of the process allows subjectivity to color results

AI-driven ESG research

Derives signals from unstructured data

Truvalue Labs

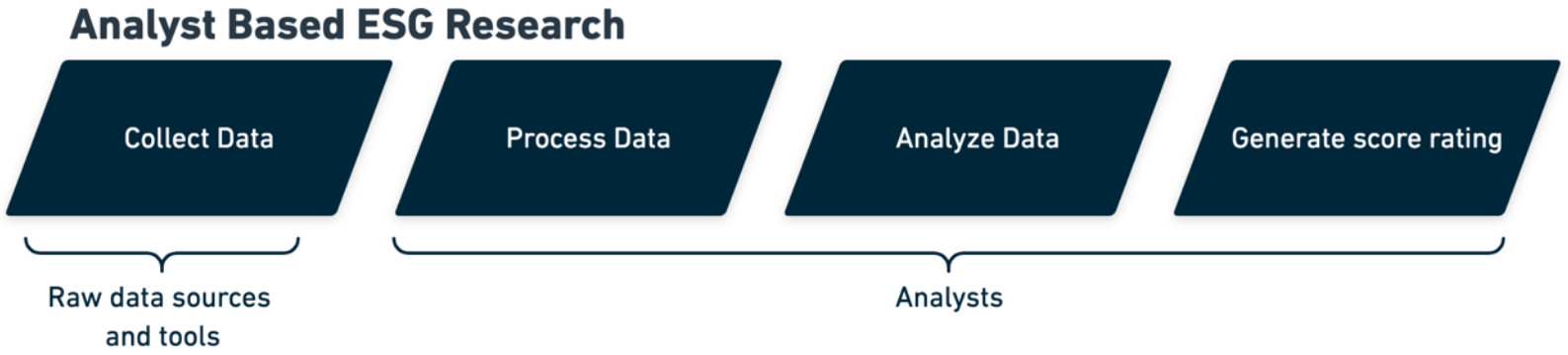


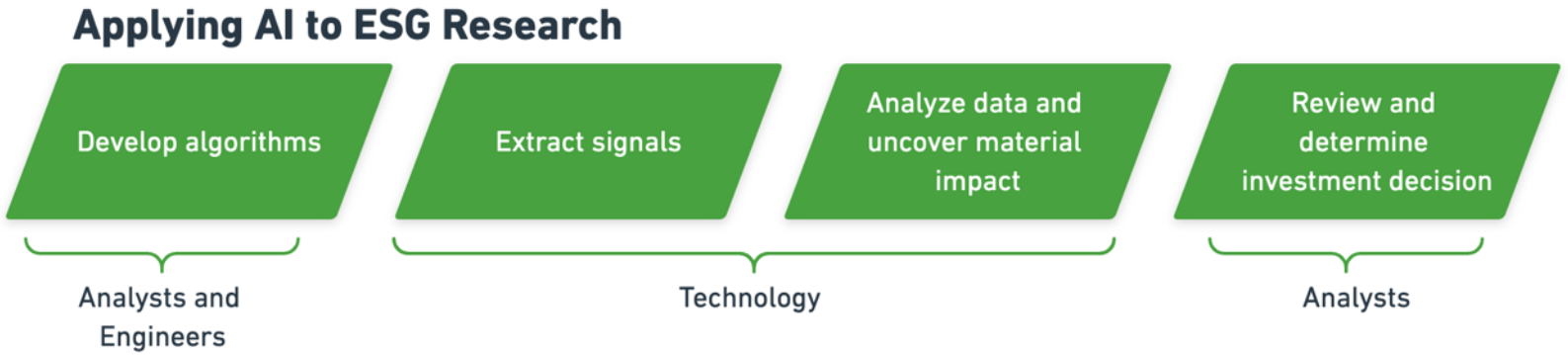
Analyst expertise at the beginning of the process produces consistent results

Source: Mark Tulay (2020), Man vs. machine: A tale of two sustainability ratings systems, GreenBiz, https://www.greenbiz.com/article/man-vs-machine-tale-two-sustainability-ratings-systems

Analyst based ESG Research

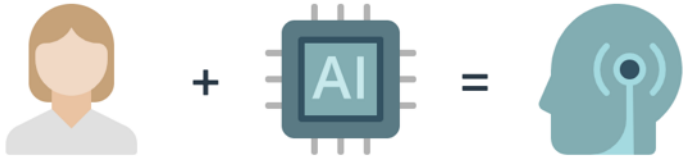
AI based ESG Research





It would take an analyst over 5 years to do what our AI can in 1 week

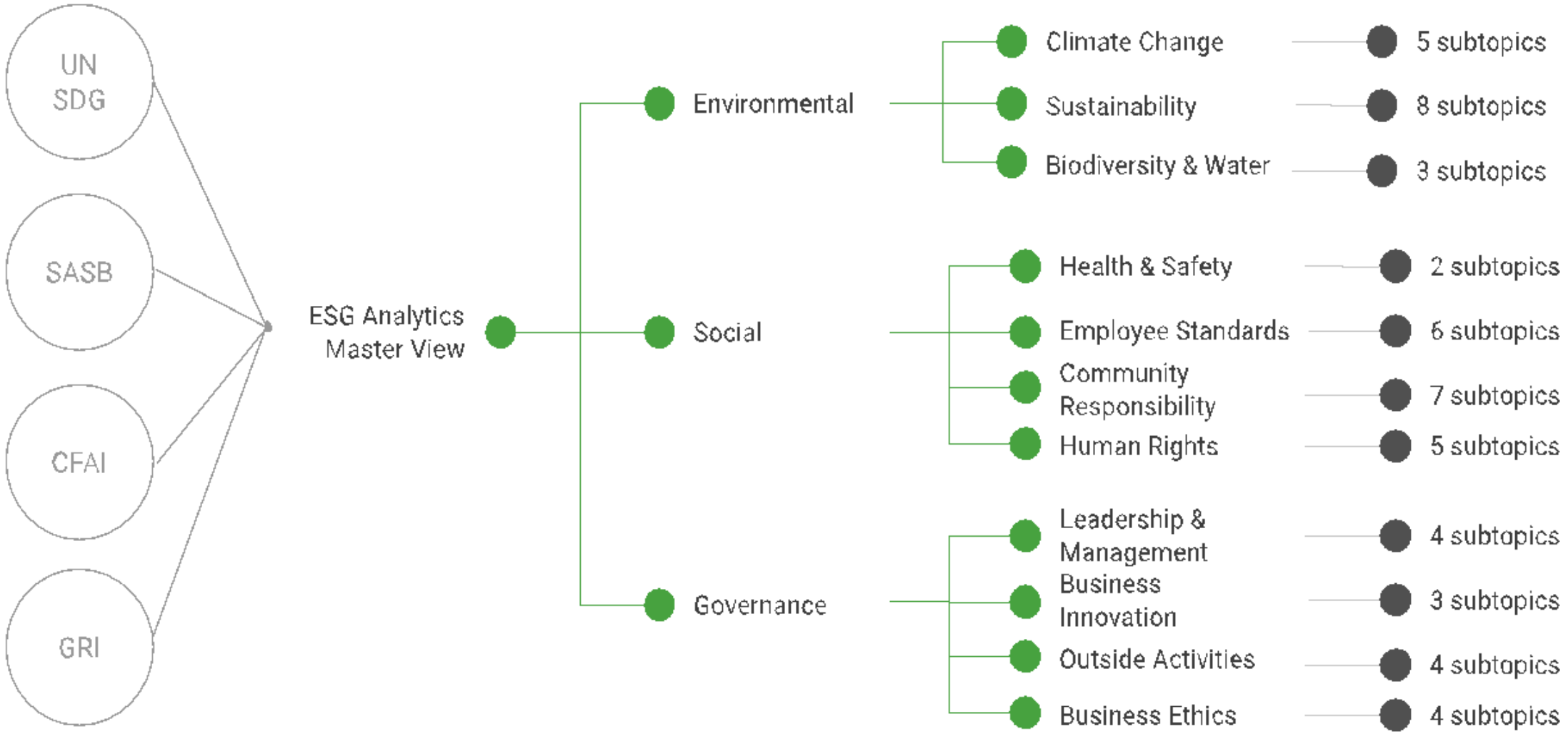
Combining analysts with AI creates gives you the full picture



ESG ANALYTICS
Invest where it matters.

Source: https://www.esganalytics.io/insights/how-data-is-accelerating-esg

ESG Analytics: NLP Taxonomy

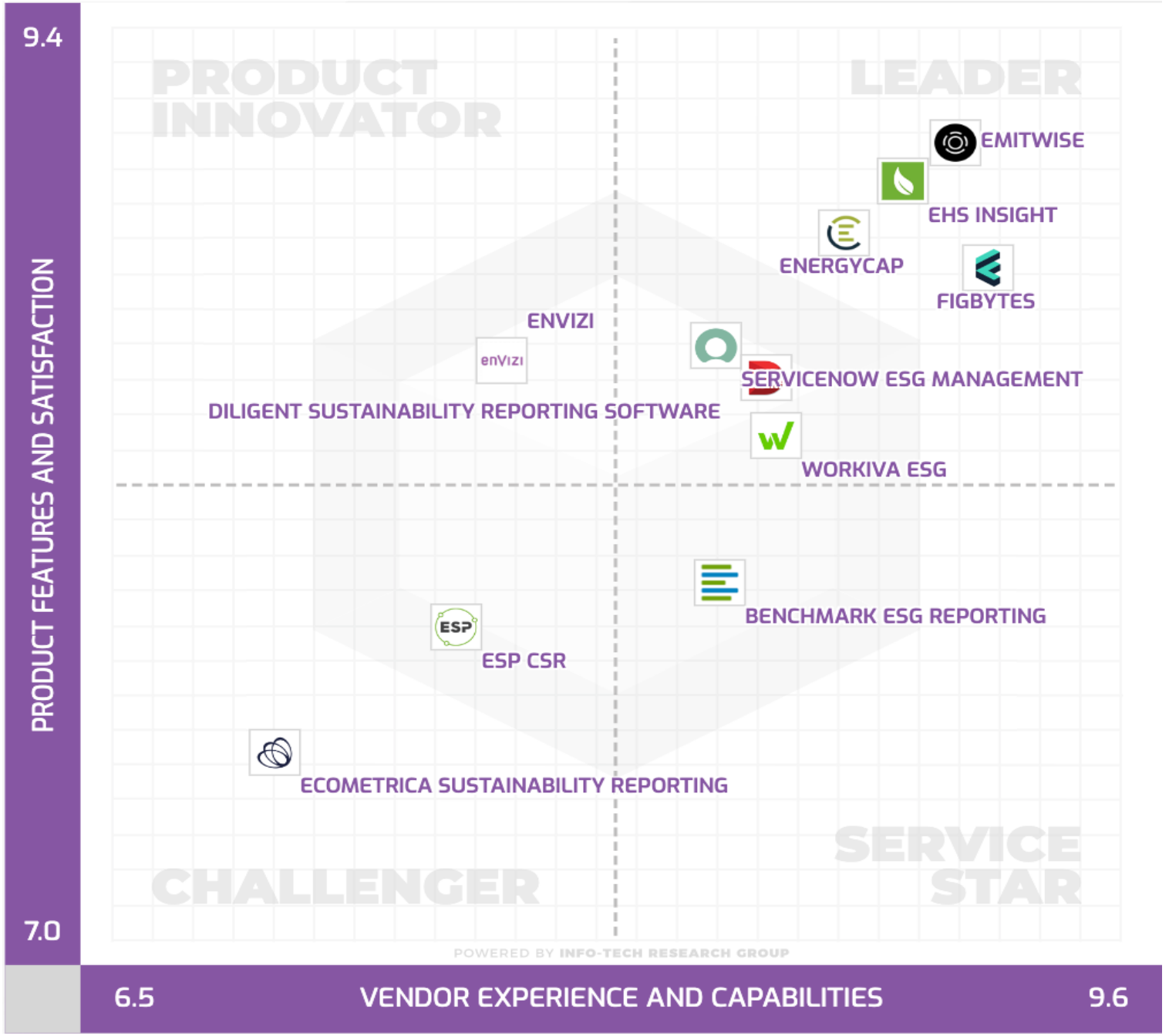


ESG ANALYTICS

Source: https://www.esganalytics.io/insights/how-data-is-accelerating-esg

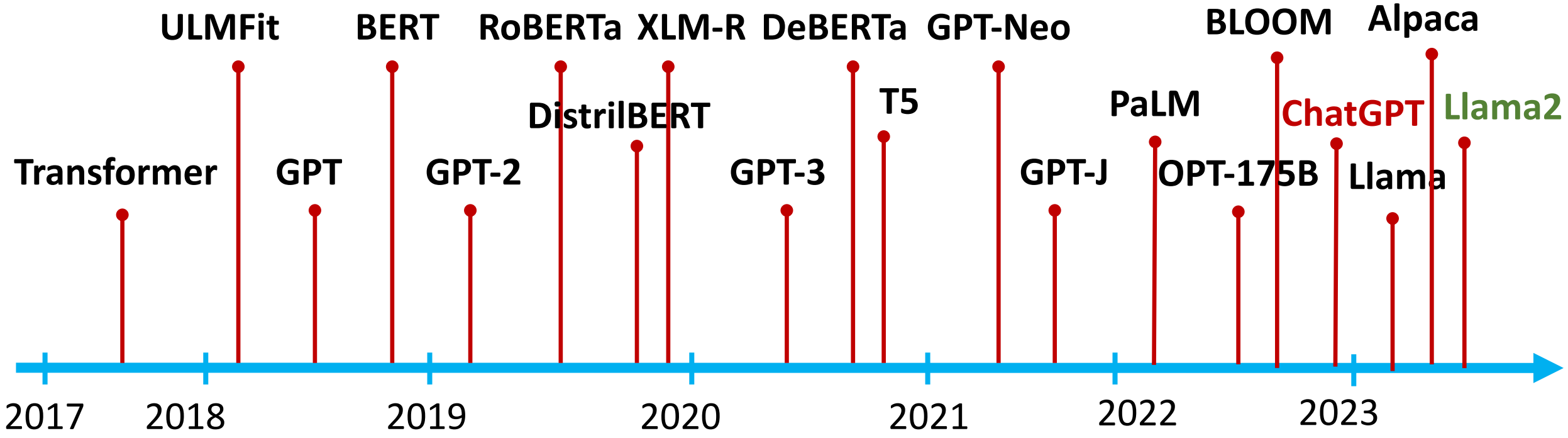
Top ESG Reporting Software

Environmental, Social and Governance (ESG) Reporting software or **Sustainability software** helps organizations manage their operational data, evaluate their impact on the environment and provide reporting to perform audits.



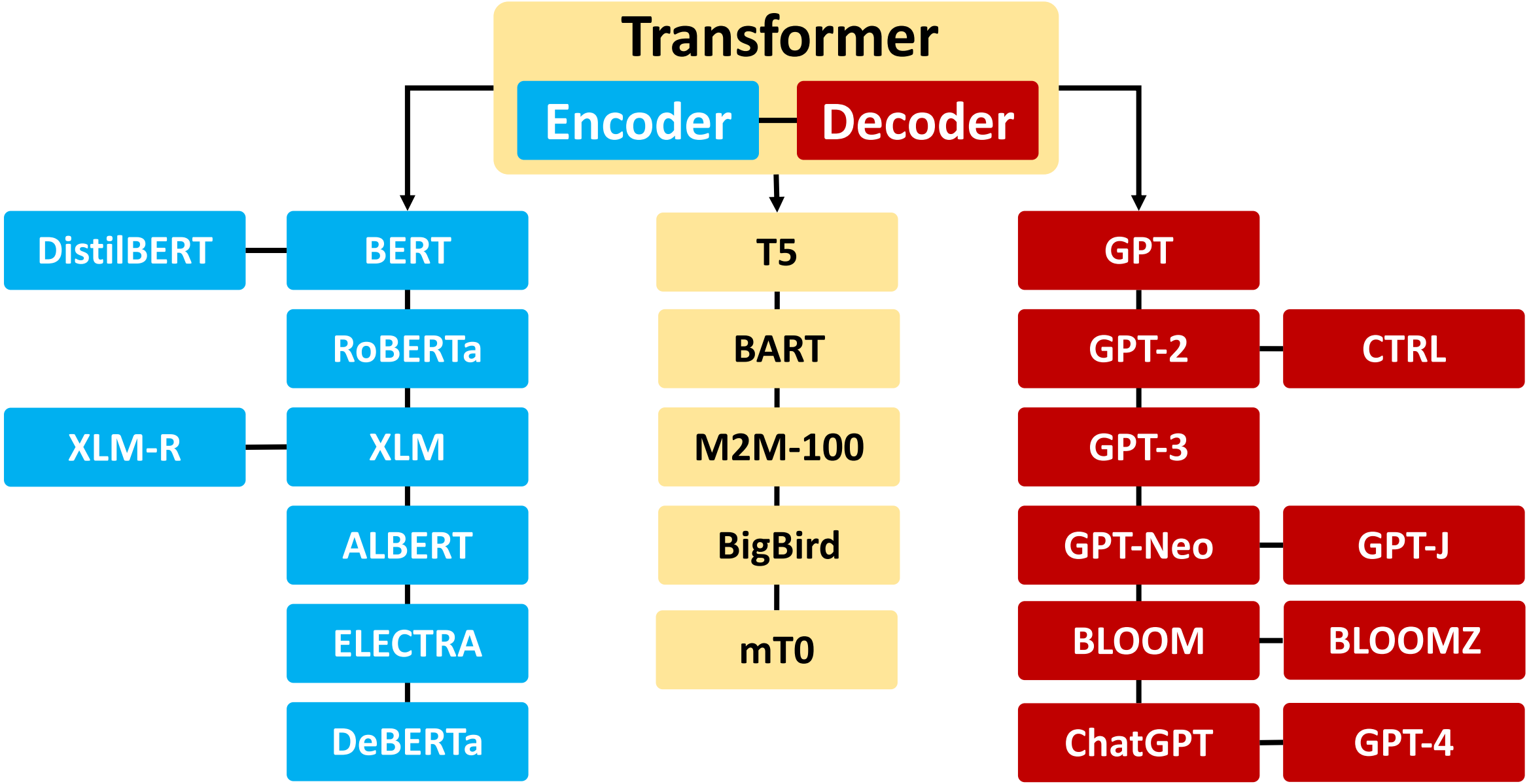
Source: https://www.softwarereviews.com/categories/environmental-social-and-governance-reporting

The Transformers Timeline



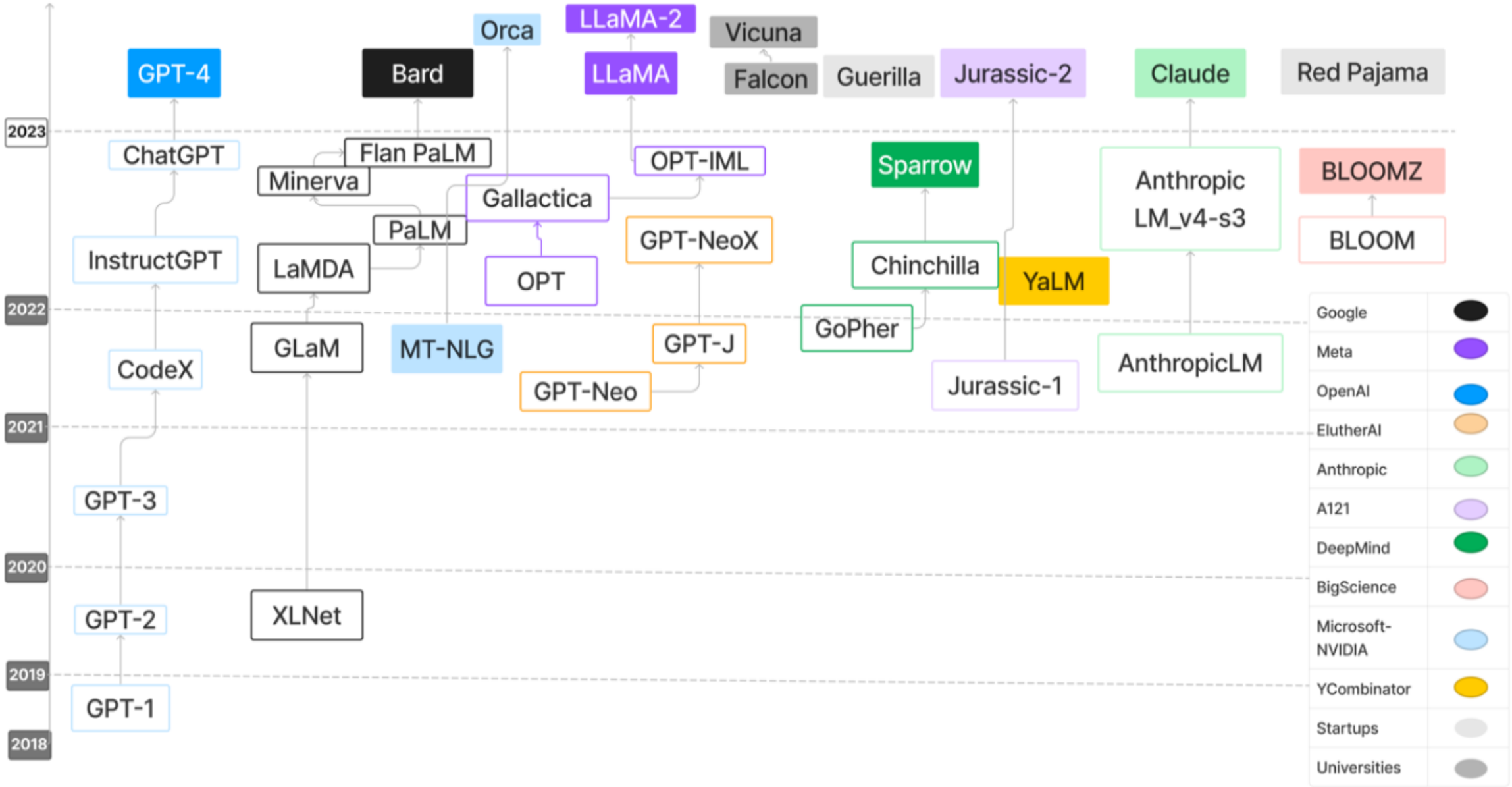
Source: Lewis Tunstall, Leandro von Werra, and Thomas Wolf (2022), Natural Language Processing with Transformers: Building Language Applications with Hugging Face, O'Reilly Media.

Transformer Models



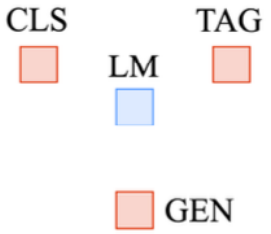
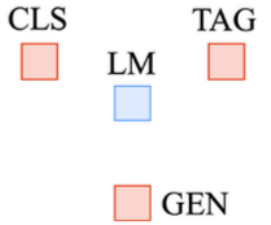
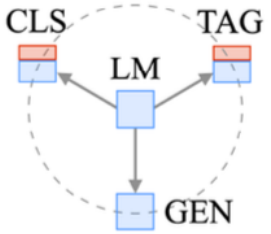
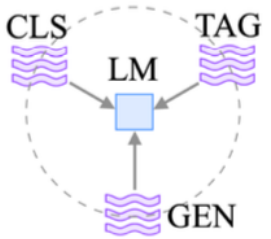
Source: Lewis Tunstall, Leandro von Werra, and Thomas Wolf (2022), Natural Language Processing with Transformers: Building Language Applications with Hugging Face, O'Reilly Media.

Large Language Models (LLMs)



Source: Hadi, Muhammad Usman, Rizwan Qureshi, Abbas Shah, Muhammad Irfan, Anas Zafar, Muhammad Bilal Shaikh, Naveed Akhtar, Jia Wu, and Seyedali Mirjalili. "Large language models: a comprehensive survey of its applications, challenges, limitations, and future prospects." Authorea Preprints (2023).

Four Paradigms in NLP (LM)

Paradigm	Engineering	Task Relation
a. Fully Supervised Learning (Non-Neural Network)	Feature (e.g. word identity, part-of-speech, sentence length)	
b. Fully Supervised Learning (Neural Network)	Architecture (e.g. convolutional, recurrent, self-attentional)	
Transfer Learning: Pre-training, Fine-Tuning (FT) c. Pre-train, Fine-tune	Objective (e.g. masked language modeling, next sentence prediction)	
GAI: Pre-train, Prompt, and Predict (Prompting) d. Pre-train, Prompt, Predict	Prompt (e.g. cloze, prefix)	

Source: Pengfei Liu, Weizhe Yuan, Jinlan Fu, Zhengbao Jiang, Hiroaki Hayashi, and Graham Neubig. (2023) "Pre-train, prompt, and predict: A systematic survey of prompting methods in natural language processing." ACM Computing Surveys 55, no. 9 (2023): 1-35.

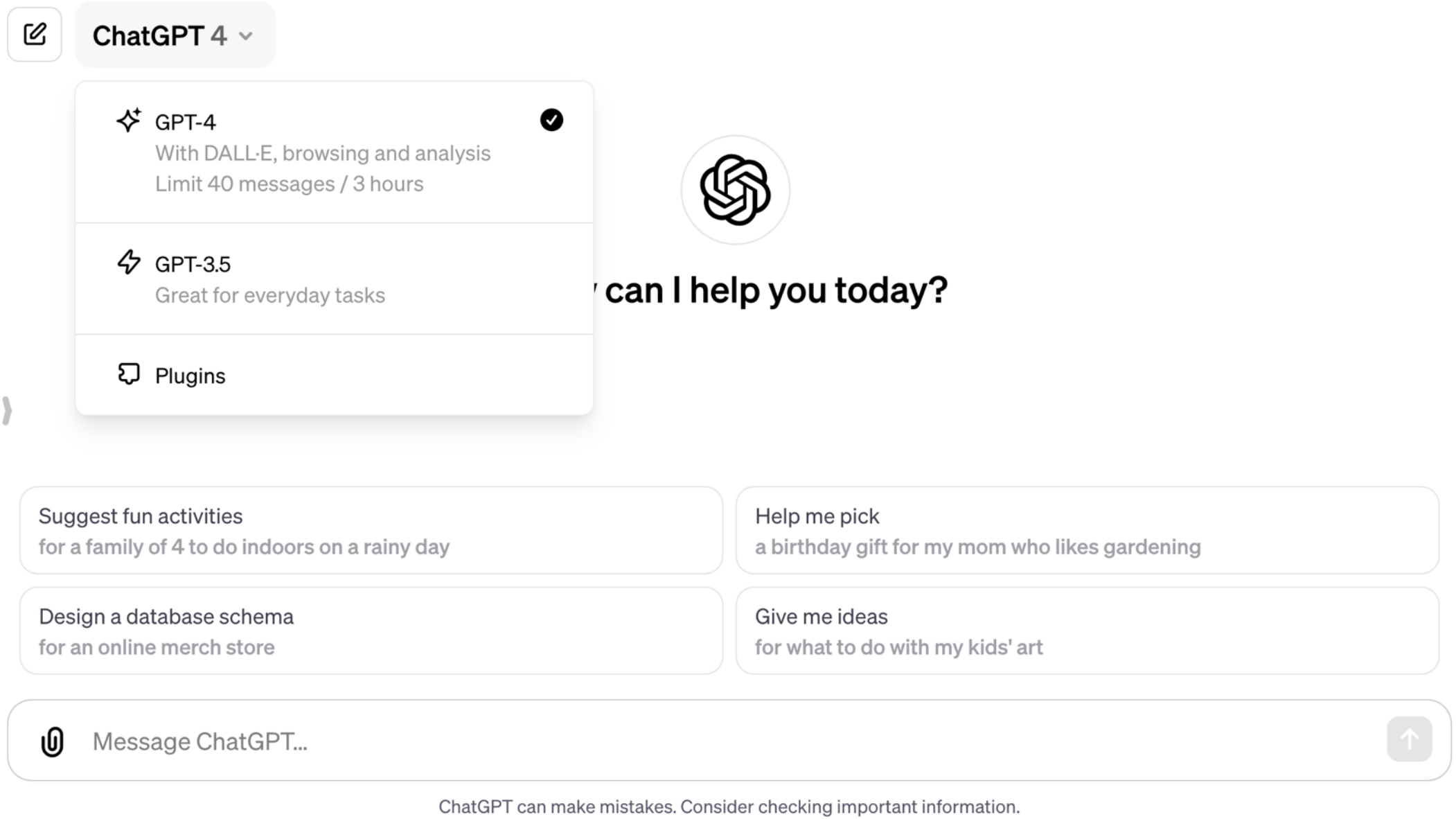
Generative AI

Text, Image, Video, Audio Applications

Popular Generative AI

- OpenAI ChatGPT (GPT-3.5, GPT-4)
- OpenAI DALL·E 3
- Perplexity.ai
- Chat.LMSys.org
- ChatPDF
- Stable Diffusion
- Video: D-ID, Synthesia
- Audio: Speechify

OpenAI ChatGPT (GPT-4, GPT-3.5)



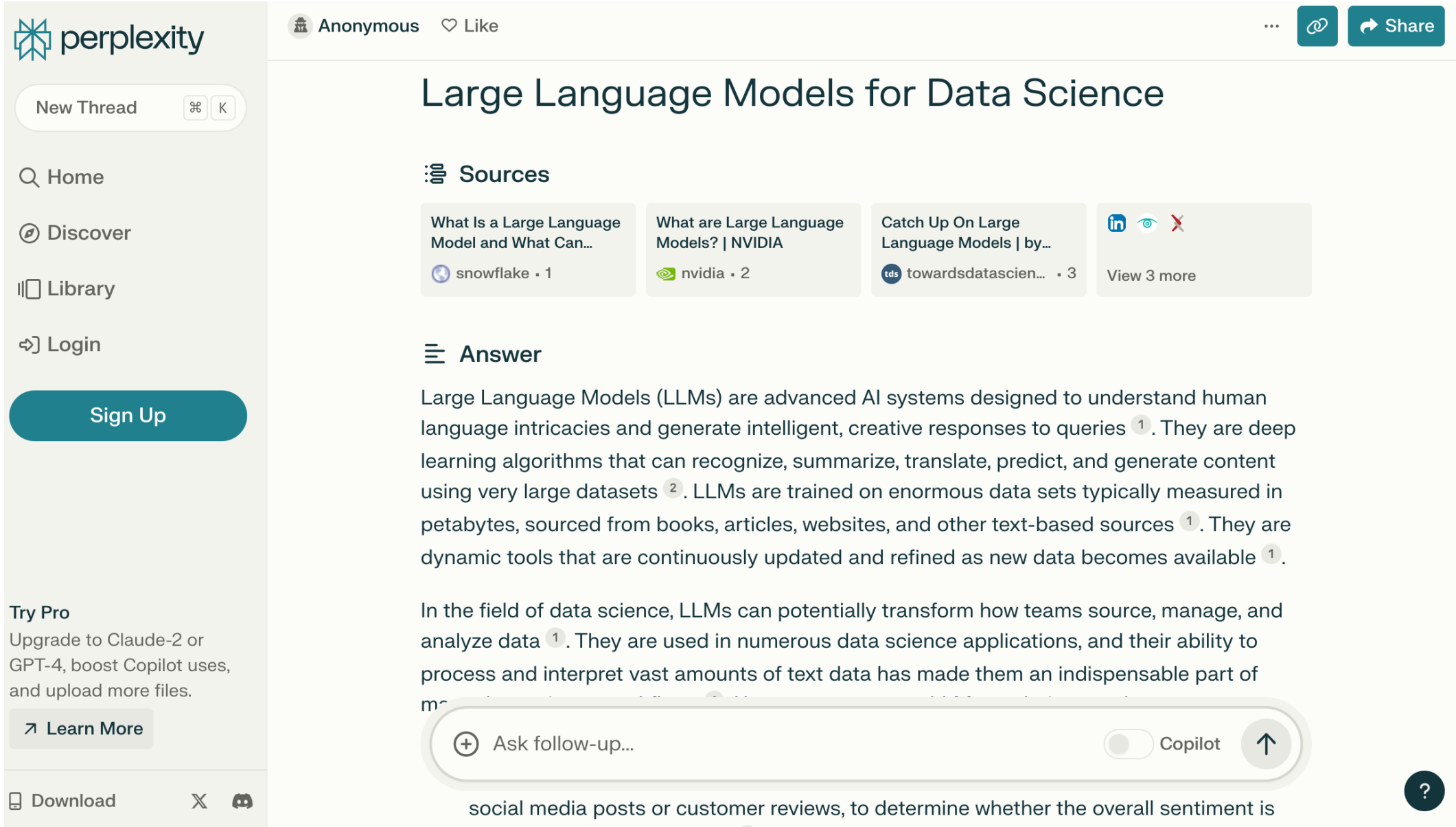
https://chat.openai.com/

OpenAI ChatGPT (GPT-4) DALL·E 3

Vector graphic of a flowchart depicting the integration of generative AI in the education process, from content creation to virtual experiments, personalized learning, and innovative learning.

https://chat.openai.com/

Perplexity.ai



https://www.perplexity.ai/

Chat with Open Large Language Models

chat.lmsys.org

⚔️ Chatbot Arena ⚔️ : Benchmarking LLMs in the Wild

Mixtral of experts: A Mixture-of-Experts model by Mistral AI

Gemini: Gemini by Google

GPT-4-Turbo: GPT-4-Turbo by OpenAI

Claude Instant: Claude Instant by Anthropic

Llama2-70B-SteerLM-Chat: A Llama fine-tuned with SteerLM method by NVIDIA

Starling-LM-7B-alpha: An open model trained using RLAIF by Berkeley

Llama 2: Open foundation and fine-tuned chat models by Meta

Code Llama: Open foundation models for code by Meta

Qwen 1.5: A large language model by Alibaba Cloud

DeepSeek LLM: An advanced language model by DeepSeek

GPT-3.5: GPT-3.5-Turbo by OpenAI

Nous-Hermes-2-Mixtral-8x7B-DPO: Nous Hermes finetuned from Mixtral 8x7B

pplx-online-llms: Online LLM API by Perplexity AI

Tulu 2: An instruction and RLHF model by UW/AllenAI

Vicuna: A chat assistant fine-tuned on user-shared conversations by LMSYS

WizardLM: An instruction-following LLM using evol-instruct by Microsoft

Bard: Bard by Google

StripedHyena-Nous: A chat model developed by Together Research and Nous Research.

Claude: Claude 2 by Anthropic

OpenChat 3.5: An open model fine-tuned on Mistral-7B using C-RLFT

OpenHermes-2.5-Mistral-7B: A mistral-based model fine-tuned on 1M GPT-4 outputs

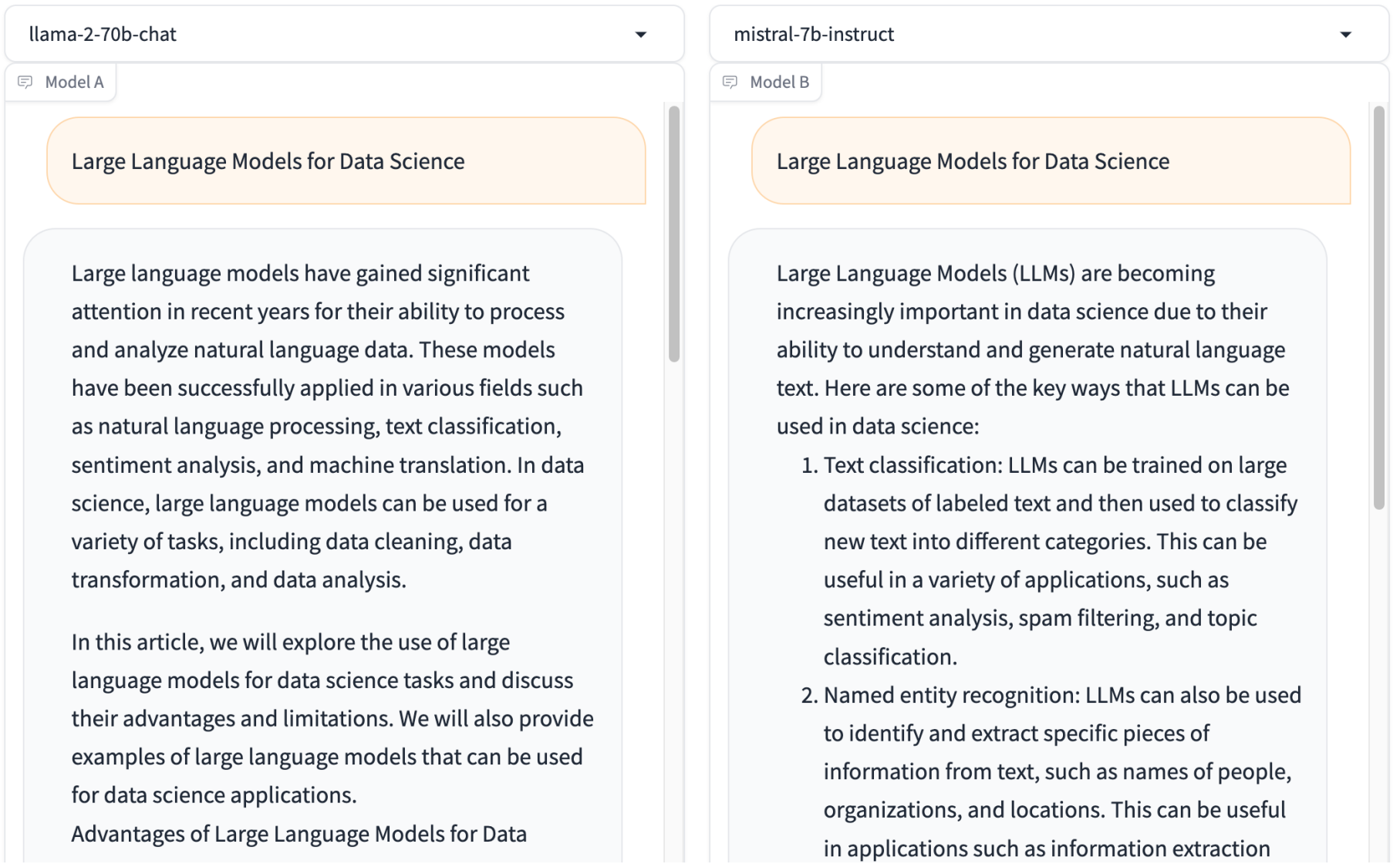
Yi-Chat: A large language model by 01 AI

Zephyr: A chatbot fine-tuned from Mistral by Hugging Face

https://chat.lmsys.org/

Chat with Open Large Language Models: Chatbot Arena

Large Language Models for Data Science



https://chat.lmsys.org/

Chatbot Arena Leaderboard

LLM Leaderboard

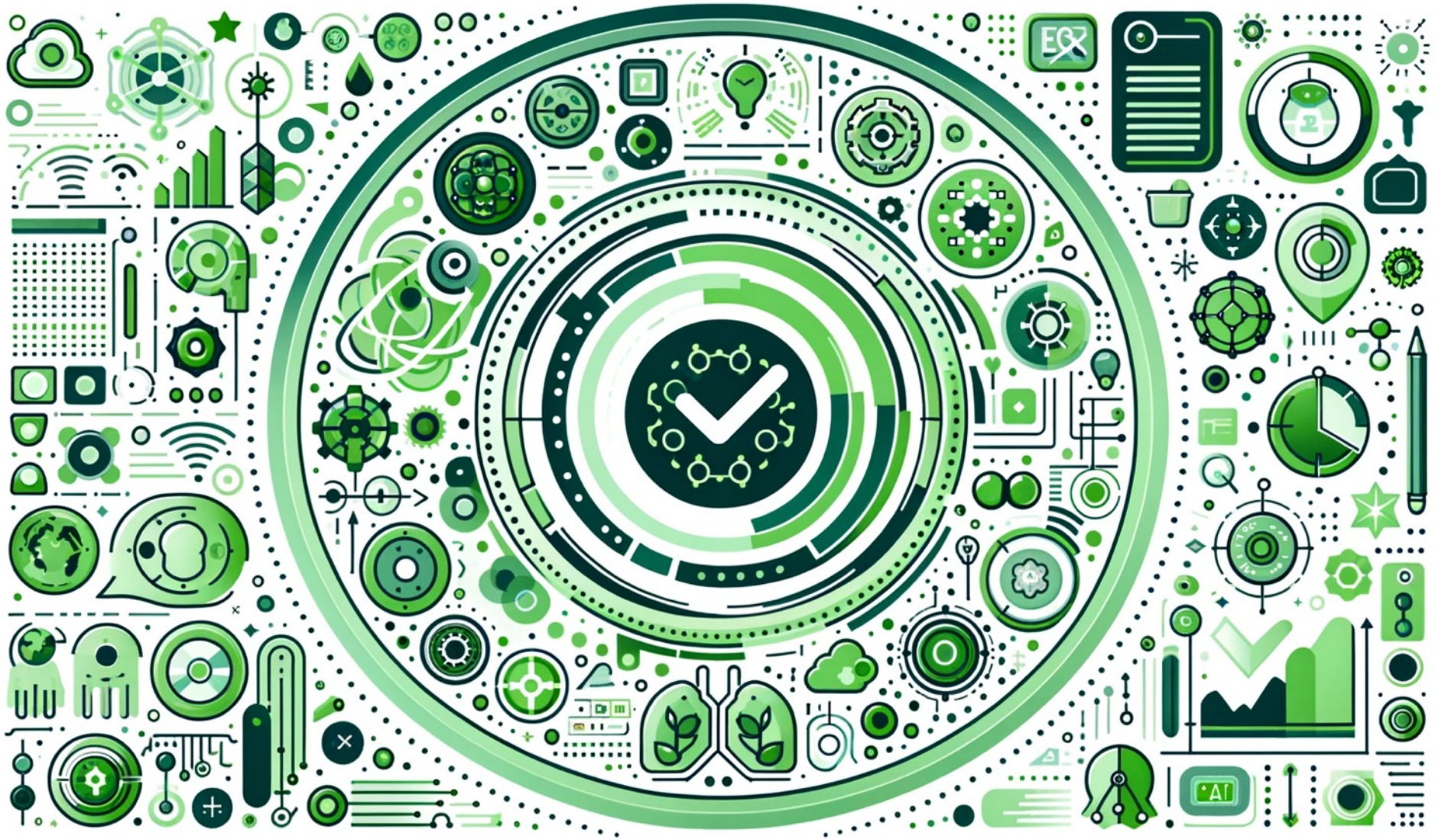
Rank	Model	Arena Elo	95% CI	Votes	Organization	License
1	GPT-4-1106-preview	1254	5/-5	38745	OpenAI	Proprietary
2	GPT-4-0125-preview	1253	10/-8	6308	OpenAI	Proprietary
3	Bard (Gemini Pro)	1218	8/-7	10313	Google	Proprietary
4	GPT-4-0314	1191	6/-6	20430	OpenAI	Proprietary
5	GPT-4-0613	1164	5/-6	32941	OpenAI	Proprietary
6	Mistral Medium	1152	5/-7	17847	Mistral	Proprietary
7	Claude-1	1150	7/-5	19017	Anthropic	Proprietary
8	Qwen1.5-72B-Chat	1147	8/-8	5204	Alibaba	Qianwen LICENSE
9	Claude-2.0	1132	6/-8	12753	Anthropic	Proprietary
10	Gemini Pro (Dev API)	1122	7/-7	9024	Google	Proprietary
11	Claude-2.1	1120	6/-4	27723	Anthropic	Proprietary
12	Mixtral-8x7b-Instruct-v0.1	1120	5/-6	18410	Mistral	Apache 2.0
13	GPT-3.5-Turbo-0613	1118	5/-5	36704	OpenAI	Proprietary
14	Gemini Pro	1115	9/-9	6958	Google	Proprietary
15	Yi-34B-Chat	1111	7/-8	7734	01 AI	Yi License

https://chat.lmsys.org/

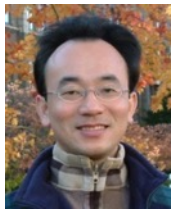
Generative AI and LLMs for Sustainability and ESG Data Analytics

Sustainability and ESG Data Analytics

Generative AI for ESG Rating and Reporting Generation



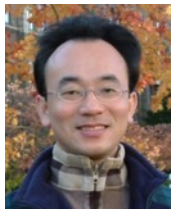
Teaching



- **Big Data Analytics**
  - Fall 2020, Spring 2023, Spring 2024
- **Software Engineering**
  - Fall 2020, Fall, 2021, Spring 2022, Spring 2023, Spring 2024
- **Artificial Intelligence in Finance and Quantitative**
  - Fall 2021, Fall 2022, Fall 2023
- **Artificial Intelligence**
  - Spring 2021, Fall 2022
- **Artificial Intelligence for Text Analytics**
  - Spring 2022, Fall 2023
- **Sustainability and ESG Data Analytics**
  - Spring 2024
- **Python for Accounting Applications**
  - Fall 2023
- **Foundation of Business Cloud Computing**
  - Spring 2021, Spring 2022, Spring 2023, Spring 2024

https://web.ntpu.edu.tw/~myday/teaching.htm

Research Projects



1. **Fintech Green Finance for Carbon Market Index, Corporate Finance, and Environmental Policies.** Carbon Emission Sentiment Index with AI Text Analytics
   - NTPU, 113-NTPU_ORDA-F-003，2023/01/01~2024/12/31
2. **Digital Support, Unimpeded Communication: The Development, Support and Promotion of AI-assisted Communication Assistive Devices for Speech Impairment (1/3).** Multimodal Cross-lingual Task-Oriented Dialogue System for Inclusive Communication Support
   - NSTC 112-2425-H-305-002-, 3 Years (2023/05/01-2026/04/30) Year 1: 2023/05/01~2024/04/30
3. **Research on speech processing, synthesis, recognition, and sentence construction of people with language disabilities.** Multimodal Cross-lingual Task-Oriented Dialogue System
   - NTPU, 113-NTPU_ORDA-F-004, 2023/01/01~2025/12/31
4. **Metaverse AI Multimodal Cross-Language Task-Oriented Dialogue System**
   - ATEC Group, Fintech and Green Finance Center (FGFC, NTPU), NTPU-112A413E01, 3 Years (2023/05/01~2026/04/30)
5. **Establishment and Implement of Smart Assistive Technology for Dementia Care and Its Socio-Economic Impacts (2/3).** Intelligent, individualized and precise care with smart AT and system integration
   - NSTC, 112-2627-M-038-001-, 2023/08/01~2024/07/31
6. **Prospective longitudinal study on peri-implant bone loss associated with peri-implantitis**
   - USTP (NTPU, TMU), USTP-NTPU-TMU-113-03, 2024/01/01~2024/12/31

https://web.ntpu.edu.tw/~myday/cindex.htm#projects

總結 (Summary)

- 本課程介紹永續數據分析基本概念與實務操作。
- 課程內容包括
  1. 永續數據分析概論
  2. 環境、社會與治理 (ESG) 淨零數位轉型
  3. 永續與ESG 資料科學
  4. Web 3.0 和大數據分析在金融科技、綠色永續金融
  5. TCFD 氣候相關財務揭露與En-ROADS 氣候變遷模擬
  6. ESG數據的收集、分析和視覺化
  7. ESG數據報告、企業永續報告書
  8. ESG數據驗證
  9. 能源之星報告與數據揭露
  10. 人工智慧物聯網在ESG永續應用
  11. 生成性AI於永續評等和報告生成
  12. 永續數據分析個案研究

永續數據分析

(Sustainability and ESG Data Analytics)

Contact Information

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Web: http://web.ntpu.edu.tw/~myday/