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# Explorable Explainers

## Group 1:

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# Agenda

- Core principles
- Examples
- Tools overview
- Tool reviews
- Our verdict

# Core Principles of Explorable Explainers

- Should encourage truly active reading
  - Reactive documents
  - Explorable examples
  - Contextual information
- Informative media with some form of interactive simulation and user guidance.

# Examples of Explorable Explainers

# Pair (Collection of explorables in the field of AI)

- For example a language model explorable

the sun is very  .

37.292% bright	17.485% hot	8.666% high
2.279% warm	1.872% weak	1.842% strong
1.692% beautiful	1.669% low	1.575% good
1.107% dark	1.040% red	0.997% big
0.892% large	0.838% young	0.825% old

BERT's predictions for what should fill in the hidden word

+ PAIR

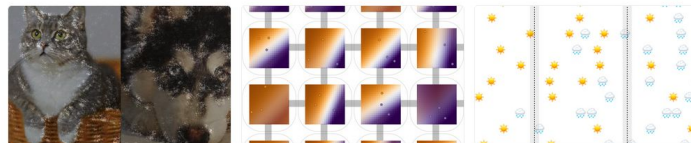
GUIDEBOOK EXPLORABLES TOOLS RESEARCH EVENTS M

## AI Explorables

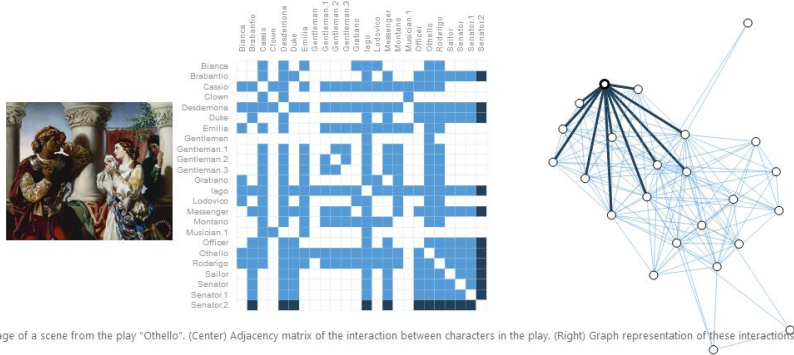
Big ideas in machine learning, simply explained

The rapidly increasing usage of machine learning raises complicated questions: How can we tell if models are fair? Why do models make the predictions that they do? What are the privacy implications of feeding enormous amounts of data into models?

This ongoing series of interactive, formula-free essays will walk you through these important concepts.



- New way to read scientific papers.
- Explore scientific papers by interacting.
- A Gentle Introduction to Graph Neural Networks.



(Left) Image of a scene from the play "Othello", (Center) Adjacency matrix of the interaction between characters in the play, (Right) Graph representation of these interactions.

<https://distill.pub/>  
<https://distill.pub/journal/>  
<https://distill.pub/2021/gnn-intro/>

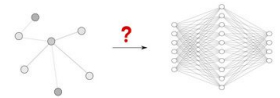
Sept. 2, 2021

PEER-REVIEWED

## Understanding Convolutions on Graphs

Ameya Daigavane, Balaraman Ravindran, and Gaurav Aggarwal

Understanding the building blocks and design choices of graph neural networks.



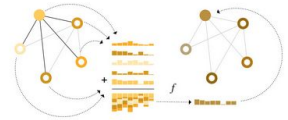
Sept. 2, 2021

PEER-REVIEWED

## A Gentle Introduction to Graph Neural Networks

Benjamin Sanchez-Lengeling, Emily Reif, Adam Pearce, and Alexander B. Wiltchko

What components are needed for building learning algorithms that leverage the structure and properties of graphs?



July 2, 2021

EDITORIAL

## Distill Hiatus

Editorial Team

After five years, Distill will be taking a break.

March 4, 2021

PEER-REVIEWED

## Multimodal Neurons in Artificial Neural Networks

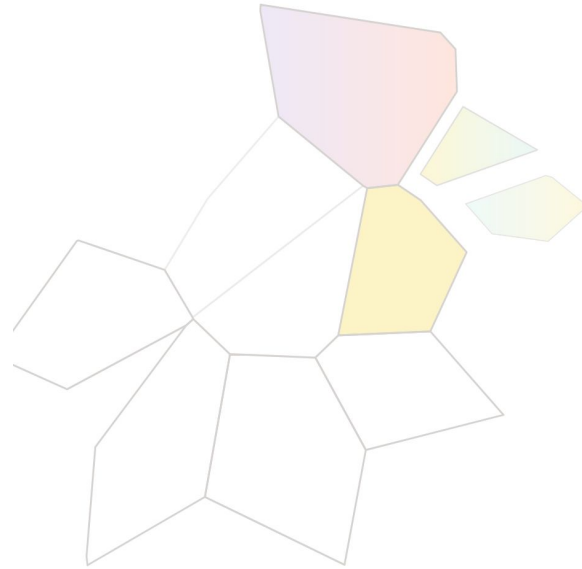
Gabriel Goh, Nick Cammarata <sup>†</sup>, Chelsea Voss <sup>†</sup>, Shan Carter, Michael Petrov, Ludwig Schubert, Alec Radford, and Chris Olah

We report the existence of multimodal neurons in artificial neural networks that have been found to be



# K-Means Clustering

- Breaks down a very complex topic into small digestible junks and makes it available for a wider audience.



## K-Means Clustering

An Explorable Explainer

By [Yi Zhe Ang](#)

### 1 Introduction

Imagine you're a felineologist, trying to identify **different groups** of species of cats. You go out into the field to collect measurements of *chonkiness* and *lightness of fur color*—key features which you believe are important in their differentiation.

So you have at hand measurements of 100 cats you've encountered.

<https://k-means-explorable.vercel.app/> by Yi Zhe Ang

# Tools



# Tools

## Python

- **Jupyter**
  - Web-based interactive computing platform
  - <https://jupyter.org/>
- Bokeh
  - Library
  - <https://bokeh.org/>
- Vega-Altair
  - Library
  - <https://altair-viz.github.io/>

## R

- **Shiny**
  - Package (library)
  - <https://shiny.rstudio.com/>

## Javascript

- **Observable**
  - Web-based interactive computing platform
  - <https://observablehq.com/>
- **D3**
  - Library
  - <https://d3js.org/>
- Tangle
  - Library
  - <http://worrydream.com/Tangle/>
- Joy.js
  - UI framework
  - <https://ncase.me/joy/>
- Idyll
  - Open-source markup language and toolkit
  - <https://Idyll-lang.org>
- Highcharts
  - Library
  - <https://www.highcharts.com/>

# Example Implementation of a Parallel Coordinates Explorable

# Dataset

- Contains artificially crafted data about student marks
  - Used to illustrate correlations using parallel coordinates
- Subjects are assigned 0 to 100 points

id	Name	Maths	English	PE	Art	History	IT	Biology	German
0	Adrian	95	24	82	49	58	85	21	24
1	Alex	78	32	98	55	56	81	46	29
2	Allison	76	47	99	34	48	92	30	38
3	Amelia	92	98	60	45	82	85	78	92
4	Anthony	75	49	98	55	68	67	91	87
5	Blake	51	70	87	40	97	94	60	95
6	Brooke	27	35	84	45	23	50	15	22
7	Cameron	70	8	84	64	26	70	12	8
8	Cassidy	96	14	62	35	56	98	5	12

# Narrative

- Explorable explainer using parallel coordinates
- Show correlations between grades
- Steps
  - Premise
  - Correlations using traditional tables
  - Application of parallel coordinates

# D3.js Standalone

- Technical Details

- Javascript lib D3.js to create SVG
- UI written in HTML and CSS
- Standalone with option to host

- UI Elements

- Datafile input
- Feature selection
- Rearrange features
- Area selection

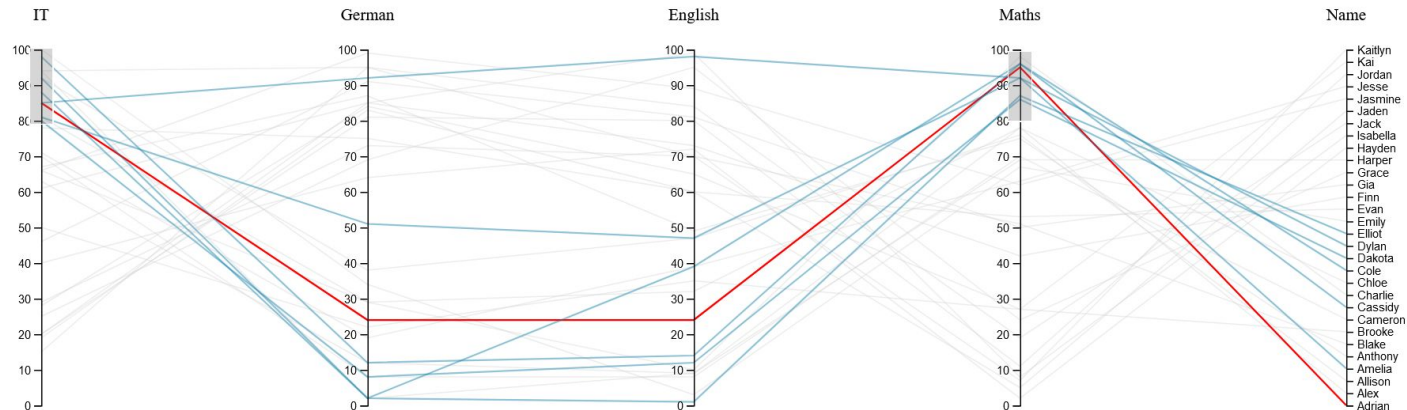
## Parallel Coordinates

Durchsuchen... student-marks.csv    Submit    Delete

Features     Name  Maths  English  PE  Art  History  IT  Biology  German

Hovered Student: Adrian

Showcase Video: [https://youtu.be/LJOsU\\_qV6Ws](https://youtu.be/LJOsU_qV6Ws)



# Jupyter Notebooks

- Types of hosting
  - Local execution
  - Hosting services
  - Dedicated server
- Multiple languages supported

- Structure elements
  - Code blocks
  - Widget for user input
  - Data table view
  - Text using Markdown

The screenshot shows a Jupyter Notebook interface with a dark theme. It includes a sidebar with navigation options like 'Python setup' and 'Dataset'. The main content area has an 'Introduction' section followed by a 'Dataset' section. The 'Dataset' section contains a paragraph of text and a table titled 'Student grades'. The table has columns for student names and grades in various subjects. At the bottom right of the table, there is a filter and pagination control showing '1 to 10 of 30 entries'.

Python setup

Code anzeigen

### Introduction

Education plays a vital role in shaping the future, and data analysis can help us to understand how to improve education outcomes. In this exploratory, we will use Jupyter notebooks to explore a dataset on student grades in various subjects using parallel coordinates. By visualizing the data in parallel coordinates, we can identify patterns and correlations that may not be apparent using traditional tables. This will provide valuable insights into the relationships between different subjects and the grades obtained by the students.

### Dataset

Our dataset comprises the grades of multiple students in different subjects. The subjects include Maths, English, PE, Art, History, IT, Biology, and German, and the grades are on a scale of 1 to 5, with 1 being the best grade and 5 being the worst grade. This dataset will allow us to explore the relationships between different subjects and the grades obtained by the students.

### Inspection using a traditional table

Before we dive into using parallel coordinates to explore the dataset, let's first take a look at the data using a traditional table. While this table provides us with some basic information about the grades of each student, it can be challenging to identify any correlations o

Student grades

Code anzeigen

Name	Maths	English	PE	Art	History	IT	Biology	German
Adrian	1	4	1	3	3	1	4	4
Alex	2	4	1	3	3	1	3	4
Allison	2	3	1	4	3	1	4	4
Amelia	1	1	2	3	1	1	2	1
Anthony	2	3	1	3	2	2	1	1

Showcase video:

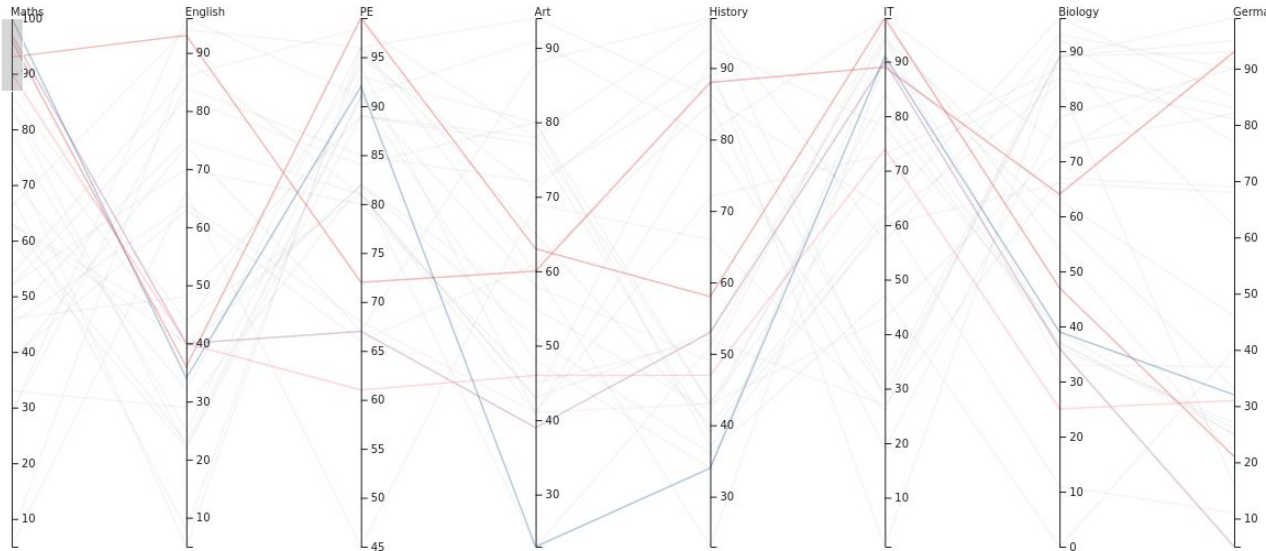
<http://youtu.be/G3GMe9djlrl>

Code:

[https://colab.research.google.com/drive/1dBuYnHp-qUA4g308d0g\\_gBQmNrVVz1OG](https://colab.research.google.com/drive/1dBuYnHp-qUA4g308d0g_gBQmNrVVz1OG)

# Observable

- Works in web
- Does not allow reordering or inverting features currently



Showcase video:  
<https://youtu.be/Dnb3JOuBPM8>

Code:  
<https://observablehq.com/d/8c75642d36c5d4d8>

# Shiny

- Package to build interactive and reactive web applications using R
  - also in alpha stage to support python
- No direct parallel coordinates support
  - Plotly, GGally, MASS
- RStudio provides online workspace and hosting
  - <https://posit.cloud>, <https://www.shinyapps.io/>

Showcase video:

[https://youtu.be/OtXB9e\\_MtDY](https://youtu.be/OtXB9e_MtDY)

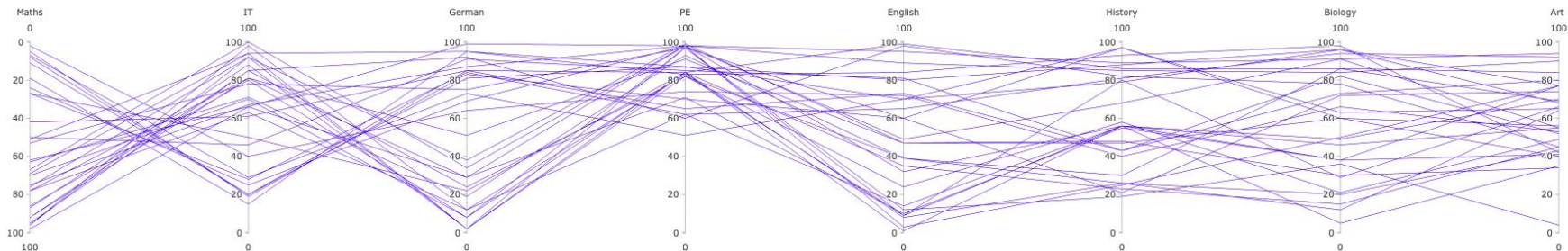
Code:

<https://6coq9k-sebastian-schrainer.shinyapps.io/project/>

## Parallel Coordinates for Student Marks

Invert Axis:

Maths  English  PE  Art  History  IT  Biology  German





# Results and Verdict

# Verdict

Ease of use

Interactivity

Customizability

Supported Graphs

D3.js Standalone



Jupyter Notebooks



Observable



Shiny



**Thank you for your Attention!**