Visualizing Github Contributions

a course project of Information Visualization

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The data - Github

- web-based Git repository hosting service / source code management platform
- open source projects
- social network-like data of how developers work on repositories

The data - Github

- Commits (additions and deletions)
- Contributors
- Star
- Fork
- Issues

Insights of data - Individual

For developers, github is a great portfolio website

- **popularities** (followers, starred)
- **projects** getting involved (repositories)
- **amount** of contributions (total commits)
- **frequency** of contributions (daily/weekly/monthly commits)
- **quality** of code (stars, forks)
- **skill** set (number of languages used)
- etc.

Insights of data - Organization

- trending **projects** (stars, forks)
- competent **developers** (number of commits, activity, etc.)
- problems (issues)
- etc.

Getting the data via Github API

Getting the trending projects during the last month

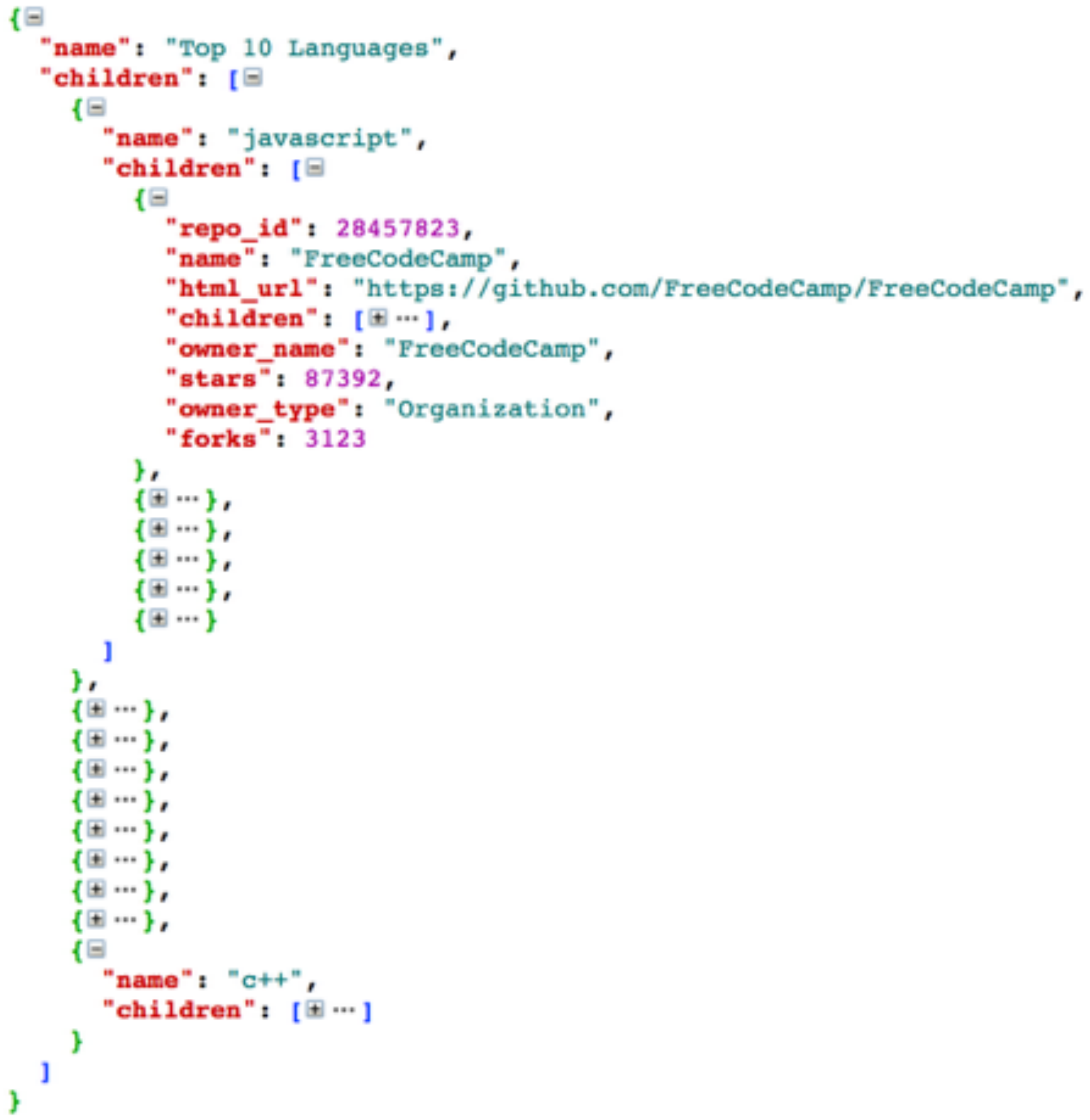
```
curl -G https://api.github.com/search/repositories \
 --data-urlencode "q=created:>`date -v-1m '+%Y-%m-
 %d'`" \
 --data-urlencode "sort=stars" \
 --data-urlencode "order=desc" \
 -H "Accept: application/vnd.github.preview" \
 | jq ".items" > trending_project_1m.json
```

Getting the data via Github API

```
{
    "id": 50603846,
    "name": "parse-server",
    "full_name": "ParsePlatform/parse-server",
    "owner": {
      …
      "type": "Organization",
    },
    …
    "stargazers_count": 6432,
    "watchers_count": 6432,
    "language": "JavaScript",
    "has_issues": true,
    "has_downloads": true,
    "has_wiki": true,
    "has_pages": false,
    "forks_count": 1335,
    "mirror_url": null,
    "open_issues_count": 105,
    "forks": 1335,
    "open_issues": 105,
    "watchers": 6432,
    "default_branch": "master",
    "score": 1
  },
```

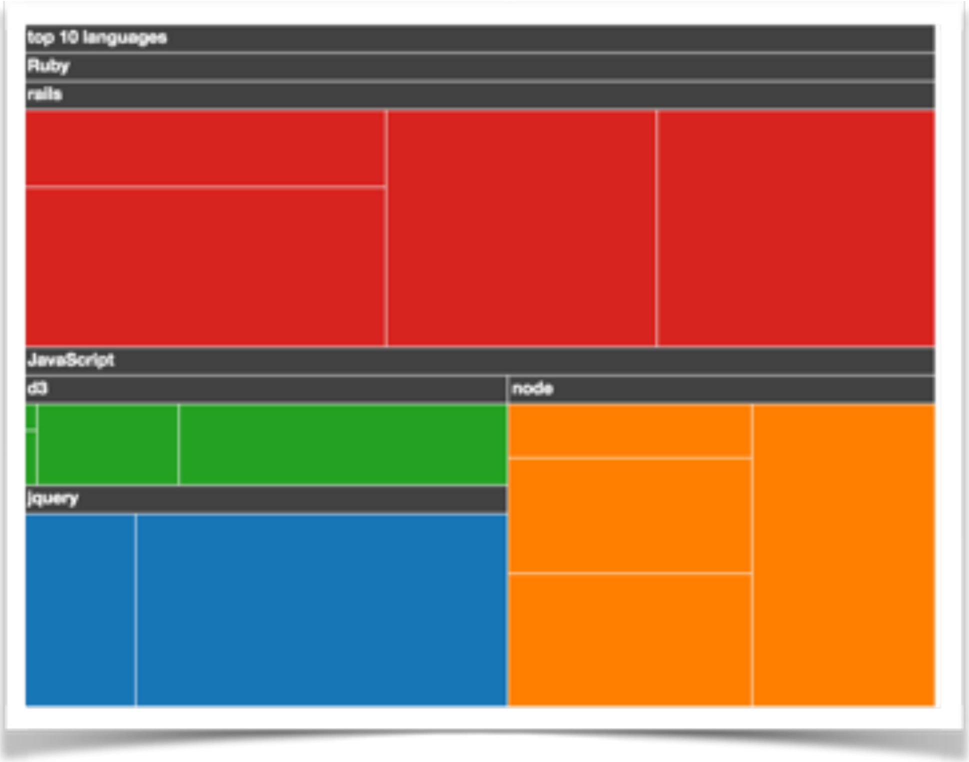
Filter the data

Format the data to be processed by d3 treemap with custom python script



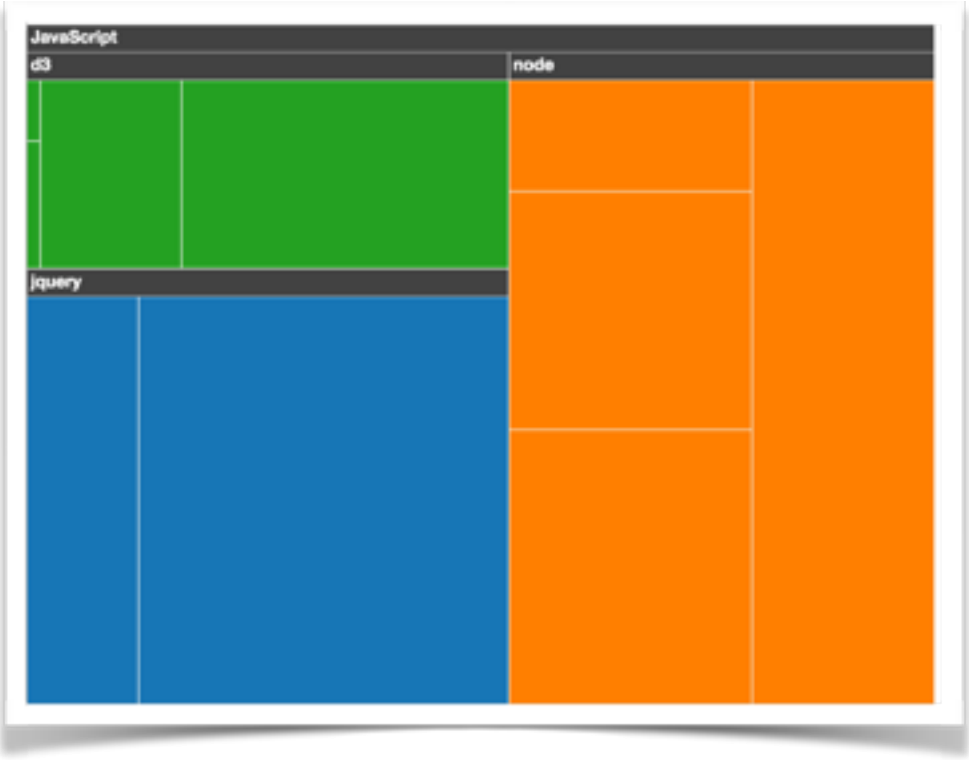
```
{⊟
  "name": "Top 10 Languages",
  "children": [⊟
    {⊟
      "name": "javascript",
      "children": [⊟
        {⊟
          "repo_id": 28457823,
          "name": "FreeCodeCamp",
          "html_url": "https://github.com/FreeCodeCamp/FreeCodeCamp",
          "children": [⊞⋯],
          "owner_name": "FreeCodeCamp",
          "stars": 87392,
          "owner_type": "Organization",
          "forks": 3123
        },
        {⊞⋯},
        {⊞⋯},
        {⊞⋯},
        {⊞⋯},
        {⊞⋯}
      ]
    },
    {⊞⋯},
    {⊞⋯},
    {⊞⋯},
    {⊞⋯},
    {⊞⋯},
    {⊞⋯},
    {⊞⋯},
    {⊞⋯},
    {⊟
      "name": "c++",
      "children": [⊞⋯]
    }
  ]
}
```

Visualization using d3 with zoom effect



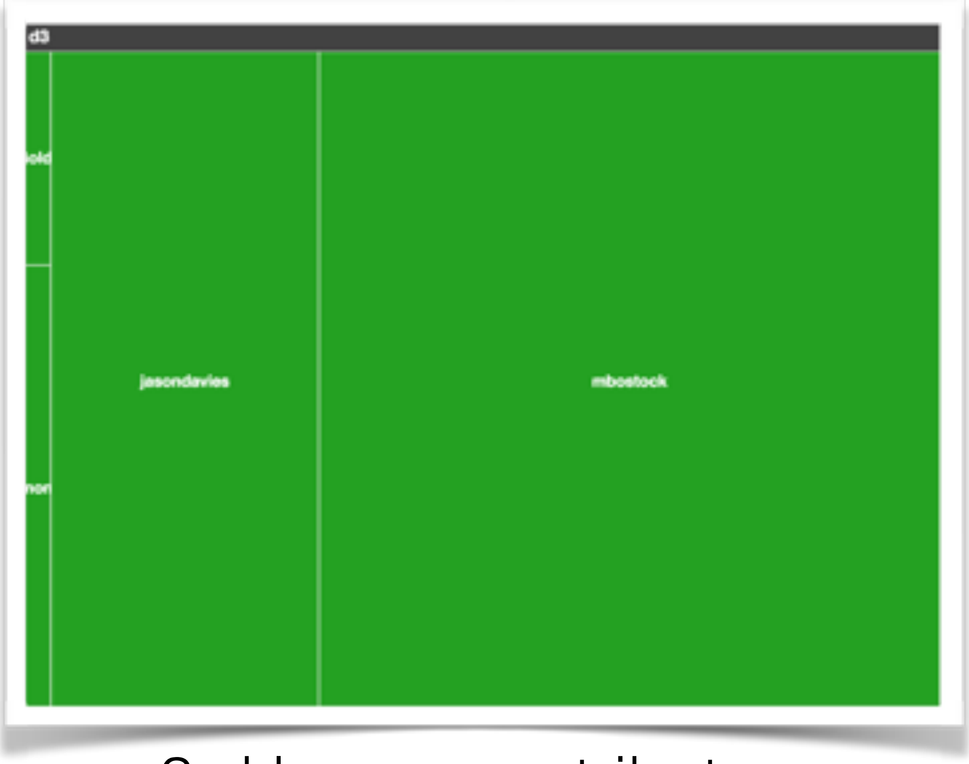
1st layer - languages

click label “Javascript”



2nd layer - projects

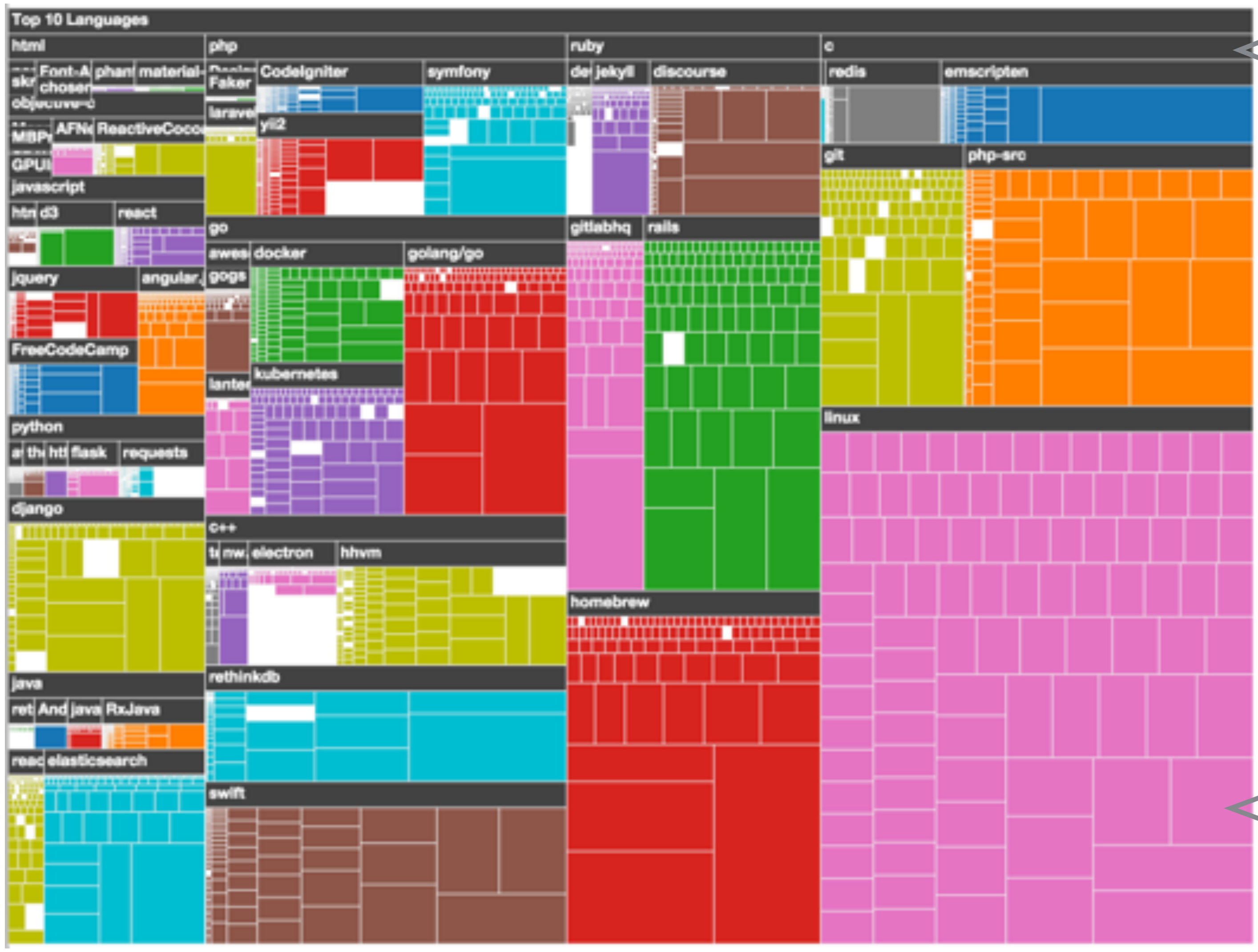
click label “d3” or any children panel



3rd layer - contributors

click any panel

Visualization using d3 with zoom effect

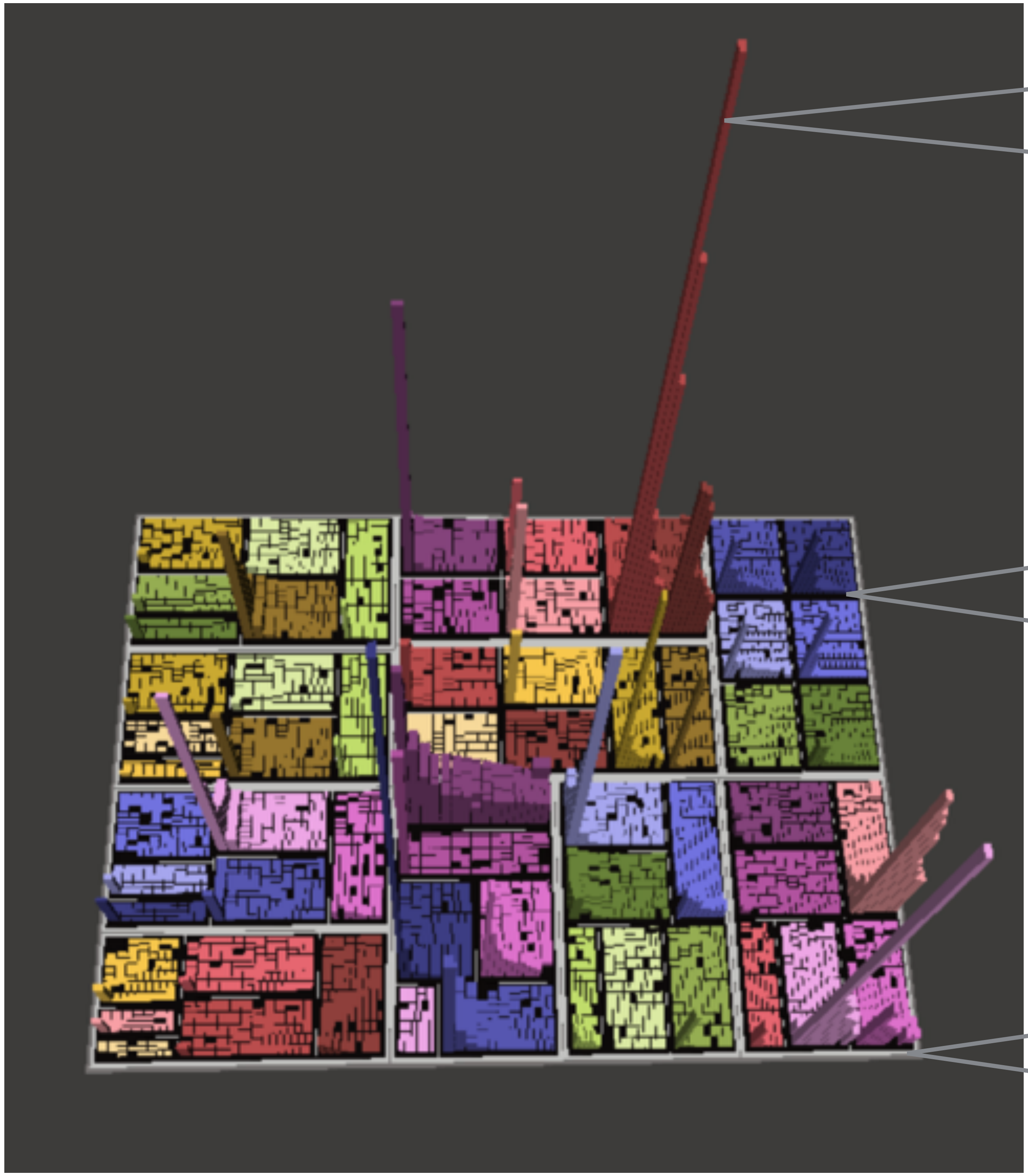


The parent label shows the (programming) language that the enclosing projects are using.

For each contributor, bigger area of node indicates larger number of total commits.

scale up to 10x6 = 60 projects with up to
100 contributors each <= 6000 child nodes

Visualization using threejs

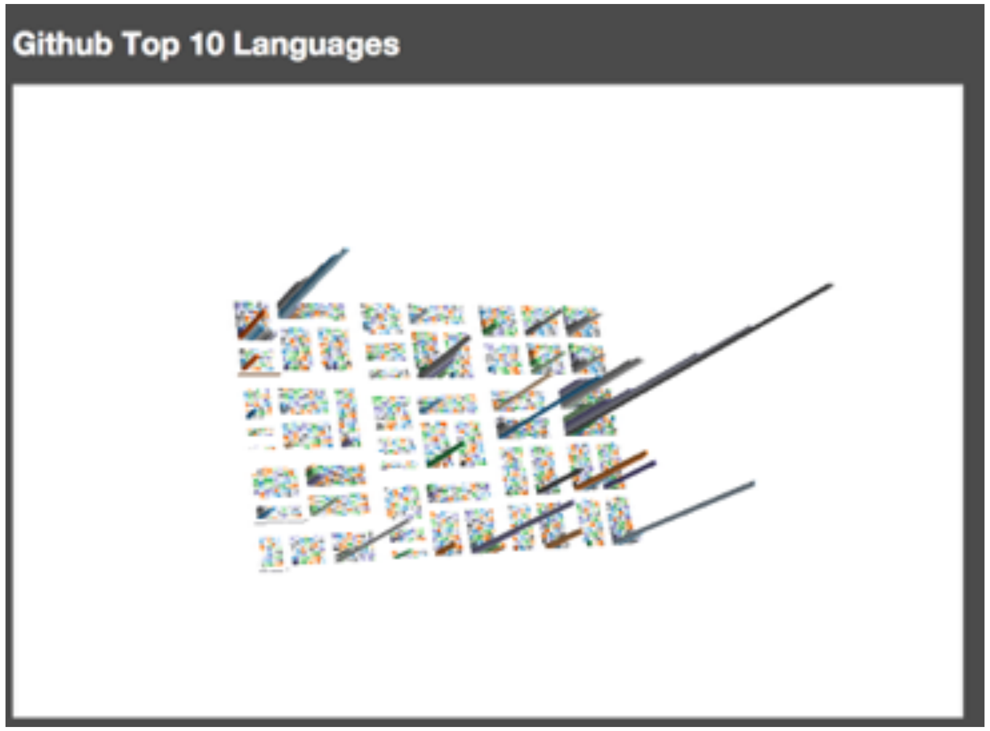


A single box represents a single contributor. The height of the box shows the number of total commits. The range of commits up to 10000 per contributor is scaled down to up to 1000 in height.

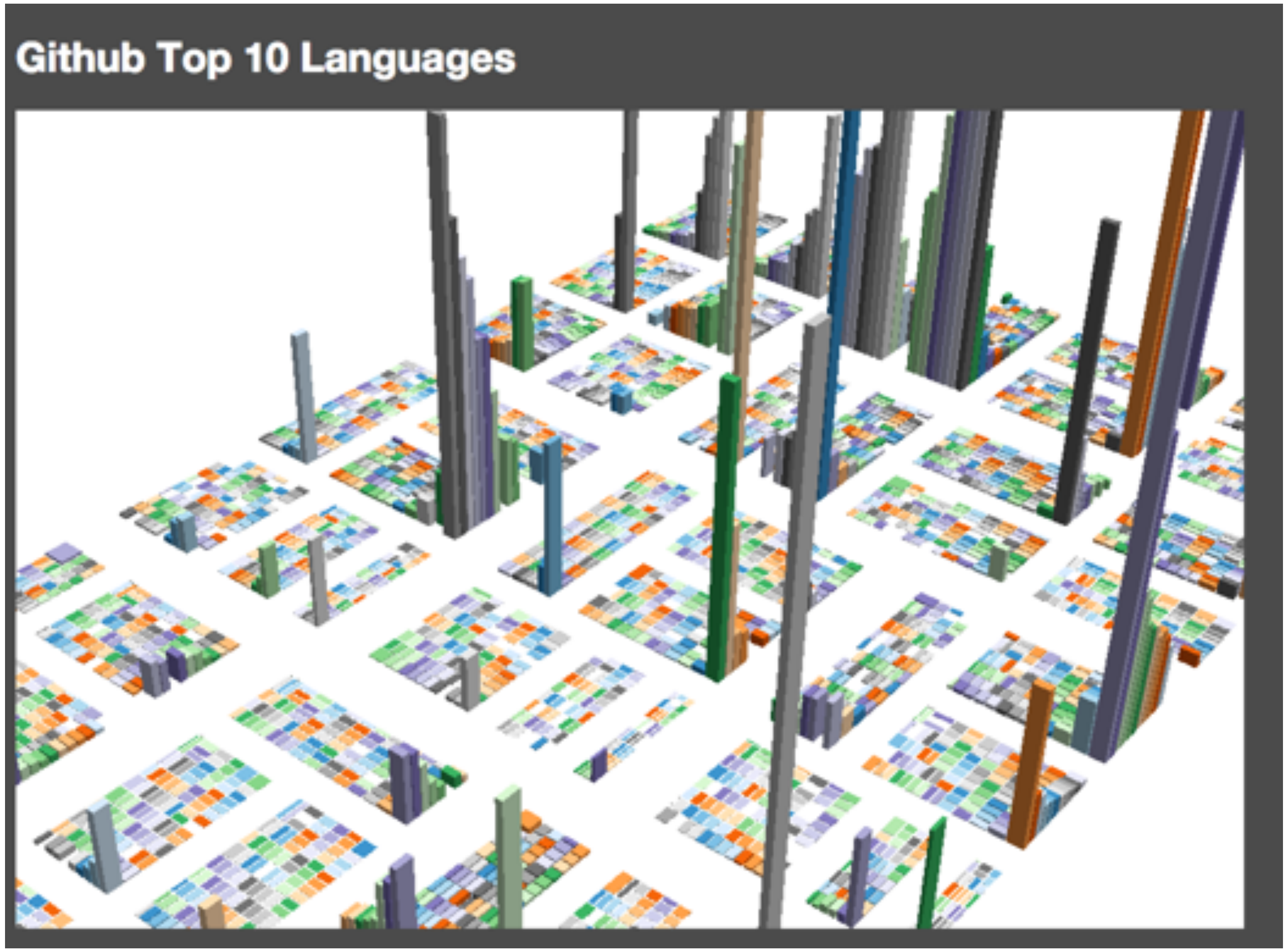
A grid in black represents a project, with a collection of contributors.

A grid in gray represents a (programming) language, which consists of six smaller grids, representing six projects.

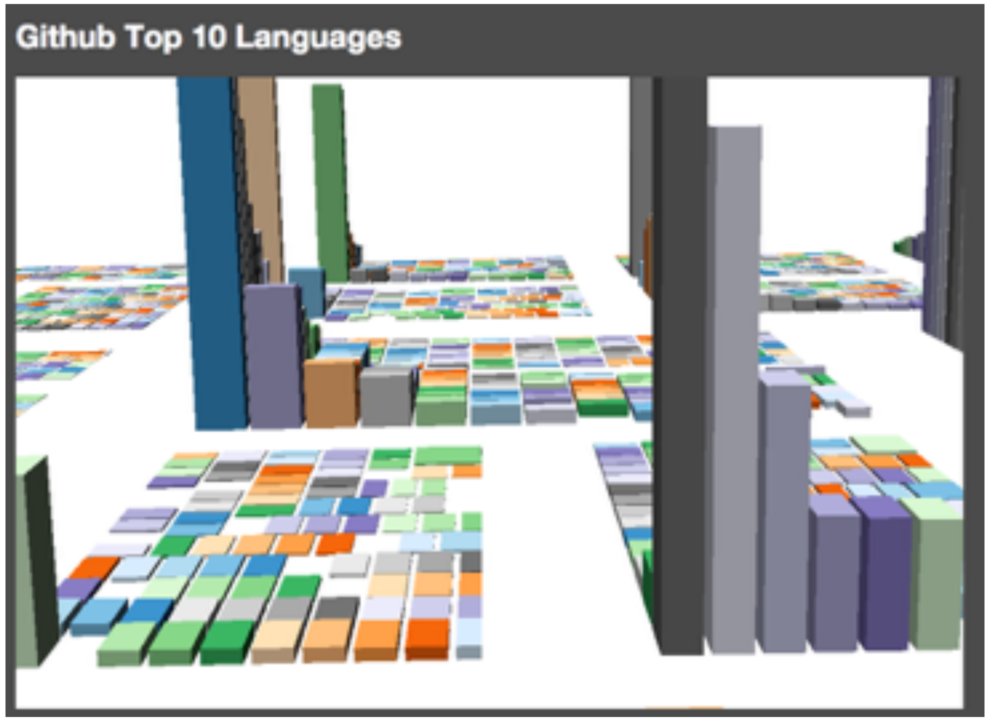
Visualization using threejs iteration v1



Github Top 10 Languages

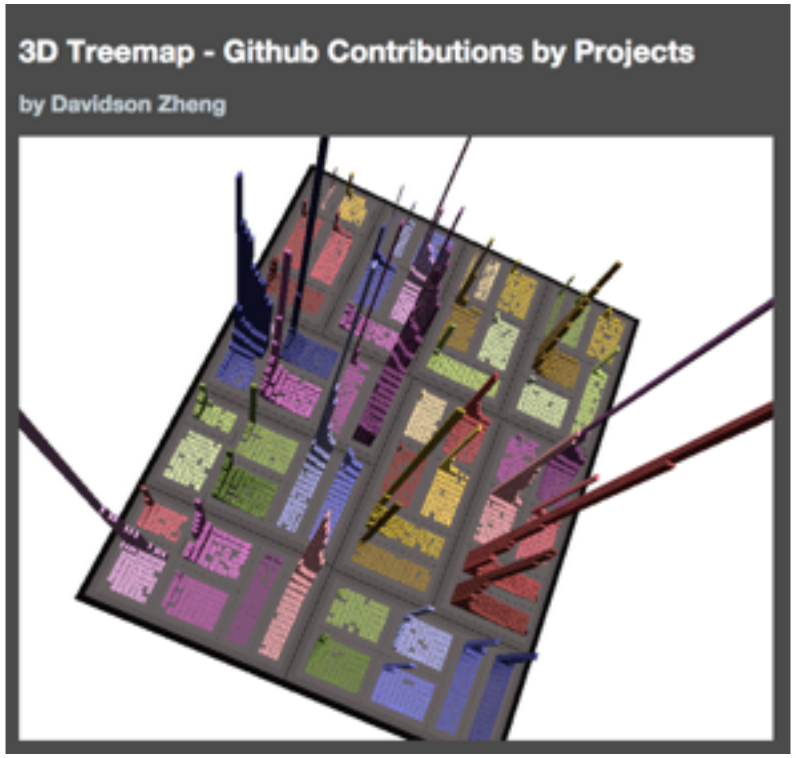


Github Top 10 Languages



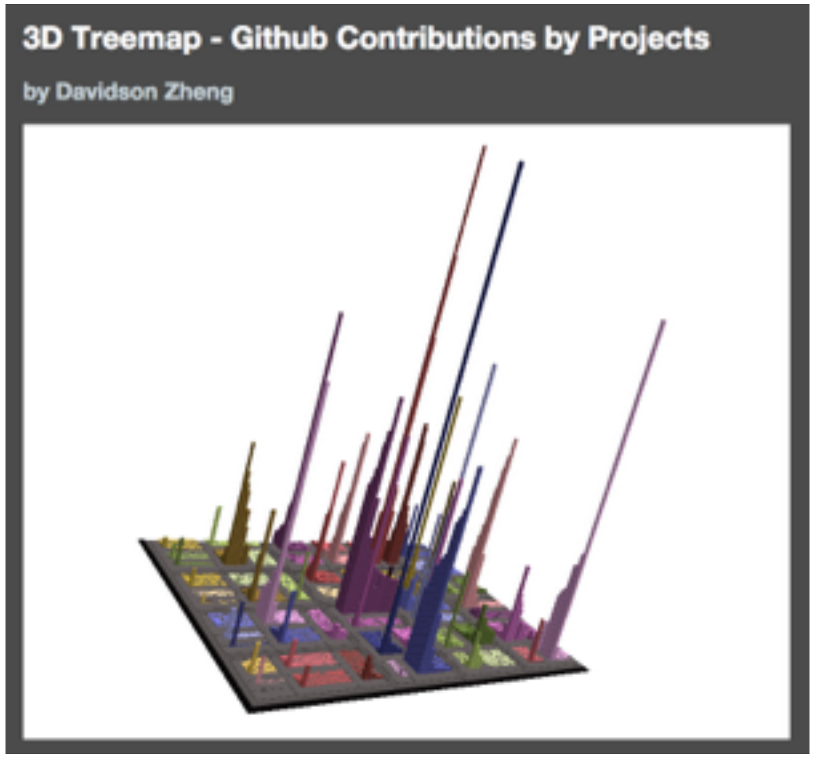
Github Top 10 Languages

Visualization using threejs iteration v2



3D Treemap - Github Contributions by Projects

by Davidson Zheng



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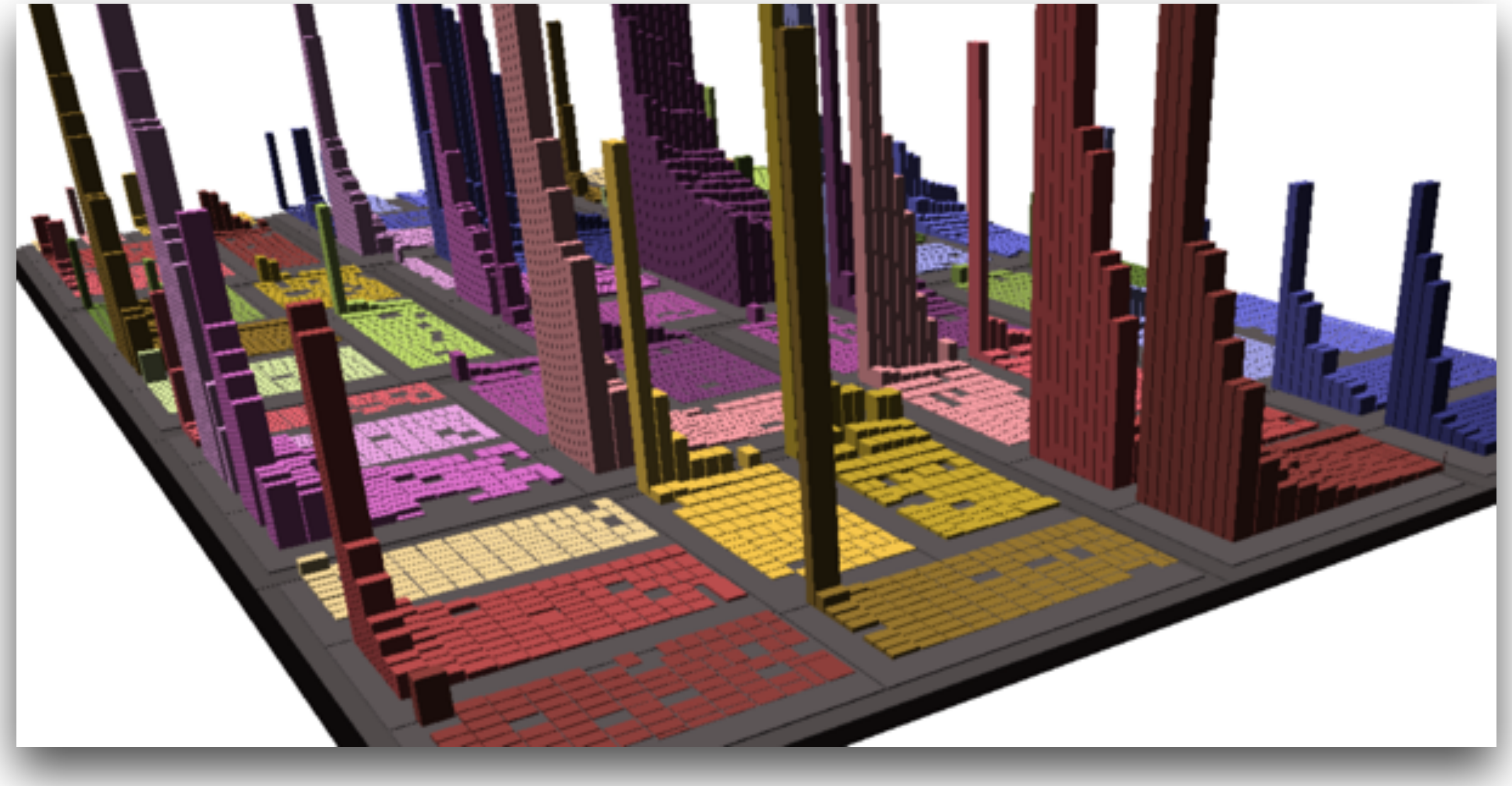


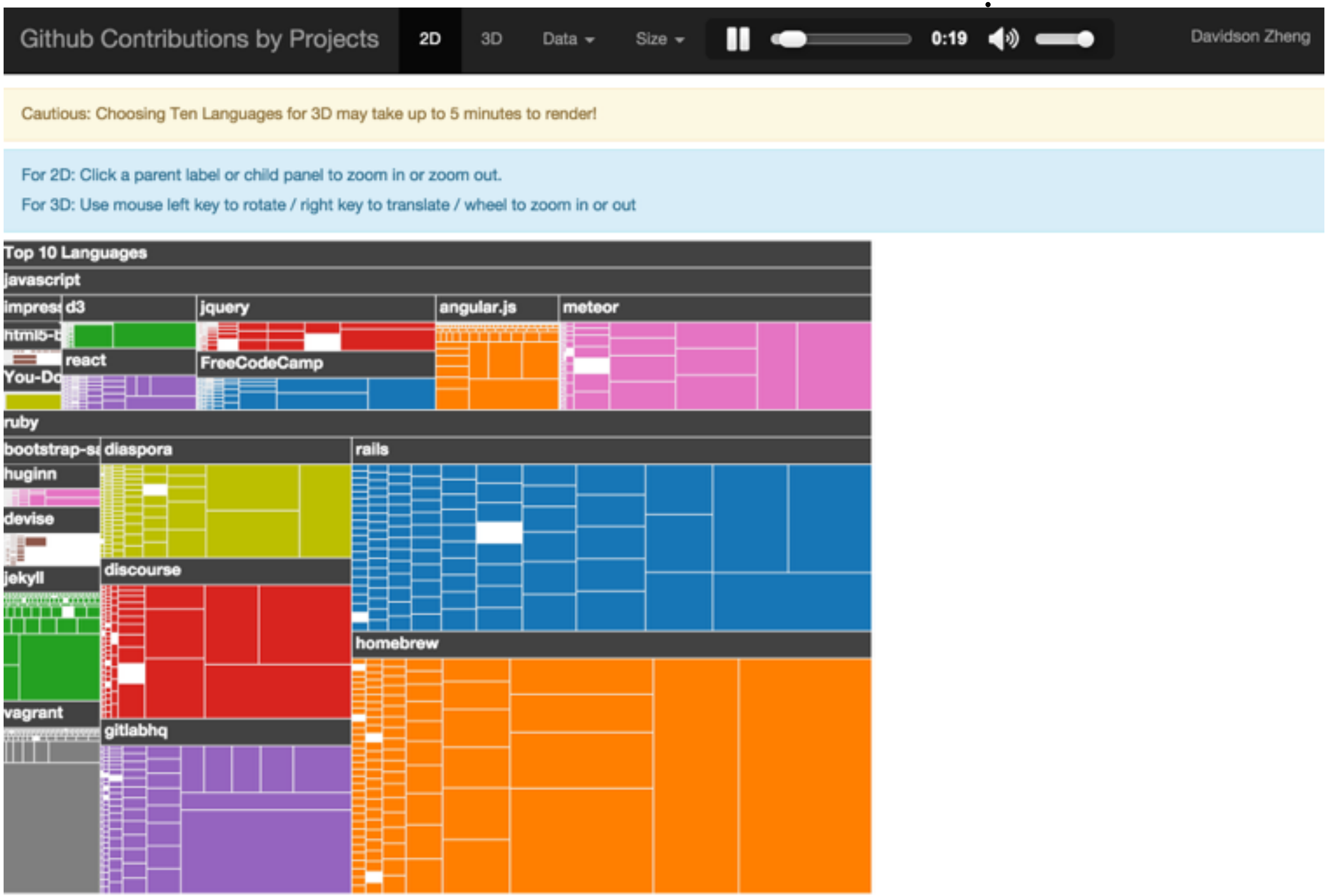
Visualization with web interface using Bootstrap

change dimension to 2D/3D

dynamically update data source

dynamically update canvas size

play music for fun!

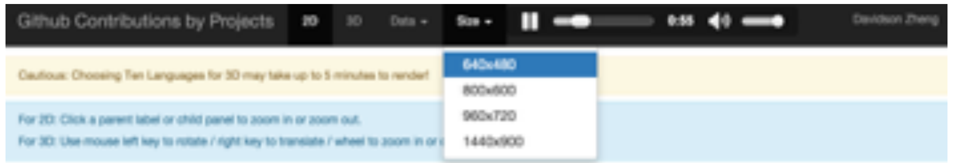


Cautious: Choosing Ten Languages for 3D may take up to 5 minutes to render!

For 2D: Click a parent label or child panel to zoom in or zoom out.

For 3D: Use mouse left key to rotate / right key to translate / wheel to zoom in or out

Visualization with web interface using Bootstrap



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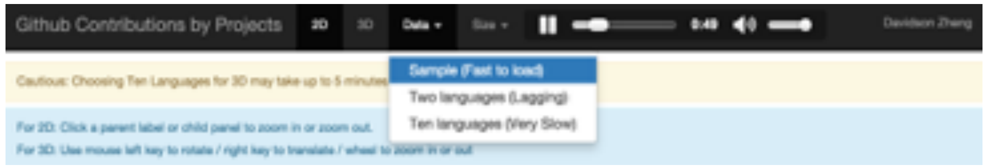

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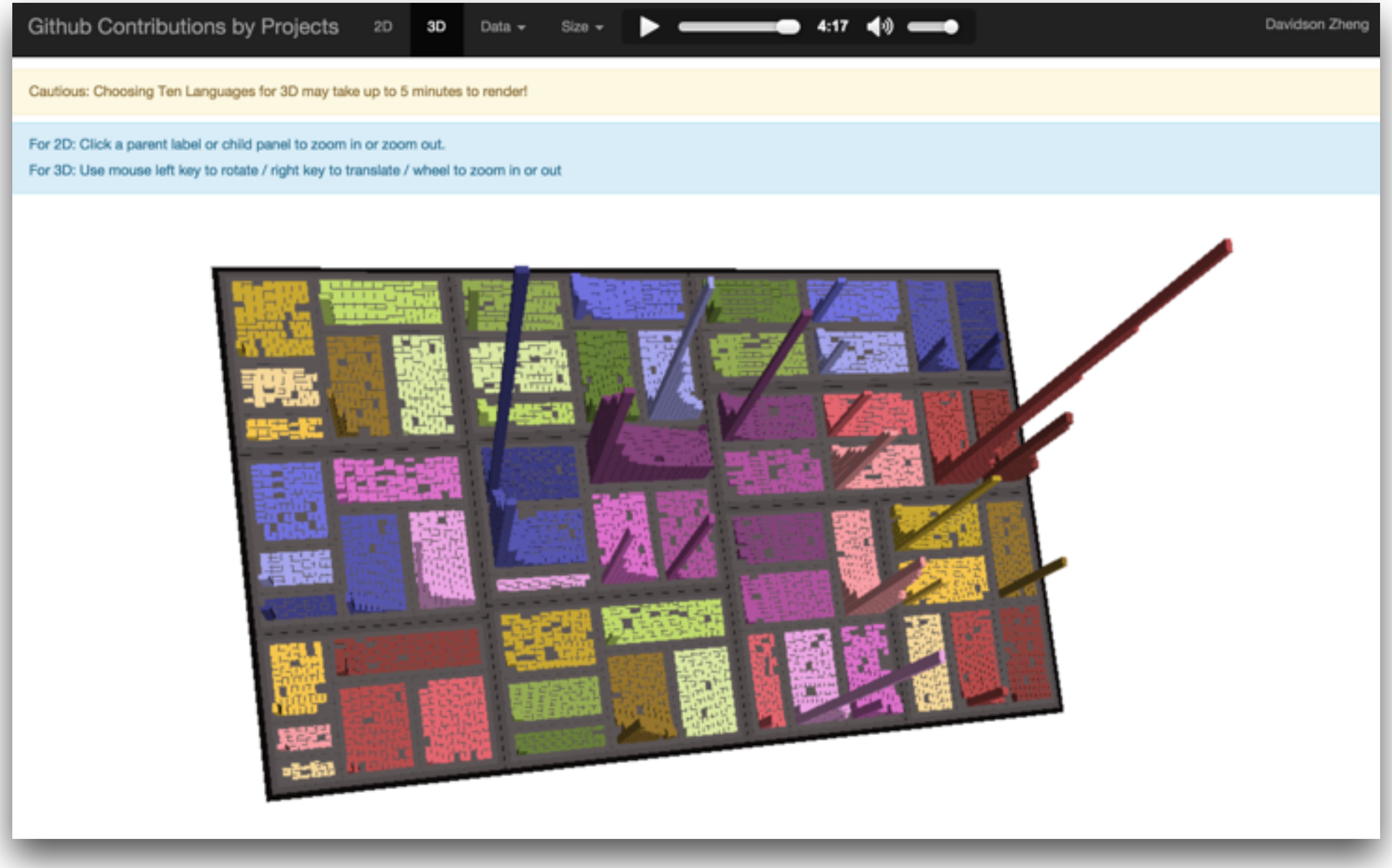

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Challenges

- jq (JSON processor) is good for retrieving and basic processing, but it is not flexible enough when manipulating data and organizing them into nested arrays

- d3 treemap + threejs, this approach by Bill White renders 3D scene using d3 treemap layout data. It is less intuitive to apply styles for different hierachies of data and add 2D text labels on top of 3D scene

- huge performance overhead when rendering large dataset that contains > 10000 nodes in web browser

- with antialiasing off, rendering quality is not satisfying

- lagging animations (zoom effect) with > 1000 nodes

- missing chunks in 2D treemap (see last slide)

- 3D scene element messes up HTML layout

Future Improvement

- Add axis and legend in 3D scene
- Add text labels (contributor names) to children nodes
- Fix missing chunk bugs in treemap layout
- Incorporate better color themes
- Change control to first-person
- Add minimap to highlight active zone
- Fadeout far objects with fogs?
- Improve initial rotation/translation
- Reduce initial performance overhead (how?)

References

d3 Treemap
https://github.com/mbostock/d3/wiki/Treemap-Layout

Counting Stars on Github (treemap visualization of github)
http://adereth.github.io/blog/2013/12/23/counting-stars-on-github/

D3 in 3D: **Combining d3.js and three.js**
http://www.billdwhite.com/wordpress/2015/01/12/d3-in-3d-combining-d3-js-and-three-js/

d3 Treemap with Title **Headers**
http://www.billdwhite.com/wordpress/2012/12/16/d3-treemap-with-title-headers/

5 entertaining things you can find with the **GitHub Search API**
https://gist.github.com/jasonrudolph/6065289

threejs examples - minecraft
http://threejs.org/examples/#webgl_geometry_minecraft