Jupyter for Education

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Acknowledgement of Country

Hayward (in the San Francisco Bay Area)

Ancestral homeland of the Ohlone people

I live in Hayward, in the San Francisco Bay Area Peninsula. I wish to acknowledge it as the ancestral homeland of the Ohlone people.

1 Introduction

1.1 What is Jupyter?

What is Jupyter?

Notebook

Kernel

Cells

Markdown

1.2 Jupyter: Existing usage

What is Jupyter for?

Exploration

Sharing

1.3 Jupyter: How it works

Jupyter Installation

Local

Remote

Or...

1.4 JupyterLite

JupyterLite

In the browser...

Some limitations

2 Modern teaching

Teaching

A new world...

2.1 A hybrid world

Hybrid world

In-person

Remotely

Self-paced

2.2 Text

Share text
Contents
Formatting

2.3 Visuals

```
from PIL import ImageFont, ImageDraw, Image

image = Image.new("RGB", (500, 200), color=(255,255,255))
draw = ImageDraw.Draw(image)
font = ImageFont.truetype("static/DancingScript-Regular.ttf", 50)
small = ImageFont.truetype("static/DancingScript-Regular.ttf", 10)
medium = ImageFont.truetype("static/DancingScript-Regular.ttf", 20)
tiny = ImageFont.truetype("static/DancingScript-Regular.ttf", 5)
draw.text((10, 10), "Worth a...", font=font, fill=(0,0,0))
for i in range(10):
    draw.text((i*45, 55), "word", font=medium, fill=(0,0,0))
for i in range(300):
    x, y = divmod(i, 50)
    draw.text((y*25, 75+x*10), "word", font=small, fill=(0,0,0))
for i in range(700):
    x, y = divmod(i, 50)
    draw.text((y*15, 135+x*7), "word", font=tiny, fill=(0,0,0))
```

Visuals
A thousand words...

image

2.4 Interactivity

```
from ipywidgets import IntSlider

slider = IntSlider(min=2, max=10)

slider
```

```
IntSlider(value=4, max=10, min=2)
```

```
slider_img = Image.open("slider-1.png").convert("RGB")
x, y = slider_img.size
slider_img = slider_img.resize((x//4, y//4))
```

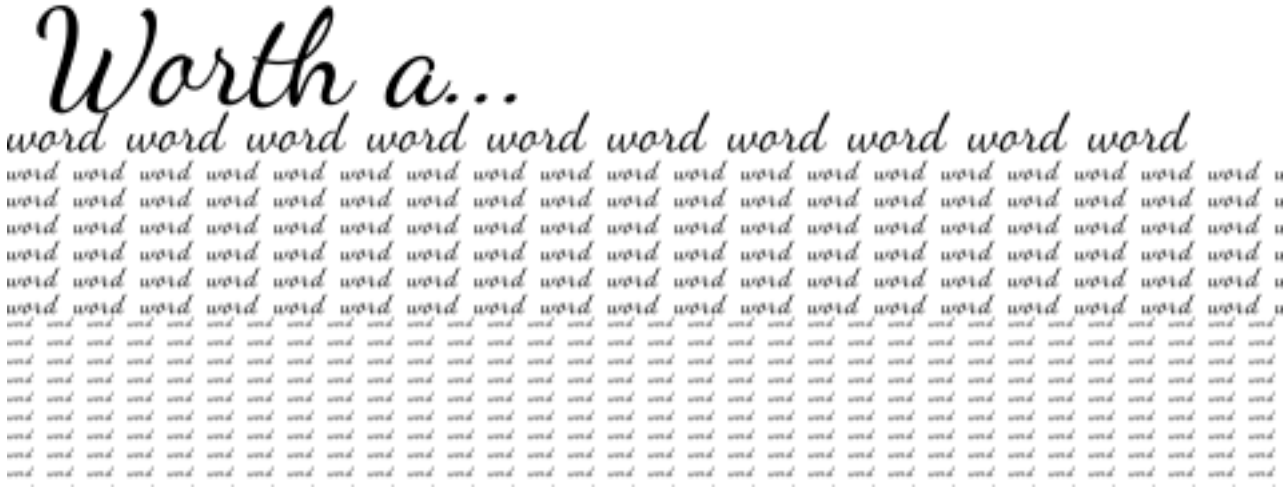

Figure 1: png

Figure 2: png

```
def draw_sample(value):
    image = Image.new("RGB", (200, 100), color=(255,255,255))
    draw = ImageDraw.Draw(image)
    font = ImageFont.truetype("static/DancingScript-Regular.ttf",
                              10 * slider.value)
    draw.text((10, 10), "Sample", font=font, fill=(0,0,0))
    return image
```

Interactivity...

Change the inputs...

```
slider_img
```

```
draw_sample(slider.value)
```

```
slider = IntSlider(min=2, max=10)
```

```
slider
```

```
IntSlider(value=2, max=10, min=2)
```

Figure 3: png

Figure 4: png

```
slider_img = Image.open("slider-2.png").convert("RGB")
x, y = slider_img.size
slider_img = slider_img.resize((x//4, y//4))
```

Interactivity...

...see the new outputs

```
slider_img
```

```
draw_sample(slider.value)
```

3 Frontal teaching

3.1 Convert

Convert for presentations

Figure 5: png

HTML
PDF
Slides

3.2 Conversion fine-tuning

nbconvert
Hide cells
Hide cell output
Hide cell input

3.3 Pipeline

Conversion pipeline
To Markdown...
...then pandoc

3.4 Collaboration

Source-control friendly
JSON
Merges can be unpleasant

4 Independent work

4.1 Sharing

Sharing
Supported in Source Collaboration
Automatically rendered

4.2 Reading materials

Reading
Inline cells
Code rendering
Widgets acknowledging

4.3 Setting up exercises

Exercise
Cells to be filled
Widgets
HTML rendering

4.4 Student verification

Verification
- Machine-checkable
- Multiple choice

4.5 Teacher feedback

Teacher feedback
- Submit notebook
- Inline submission through API

5 Summary

5.1 Limitations

Limitations
- Server set-up non-trivial
- JupyterLite still limited

5.2 Advantages

Advantages
- Powerful tooling
- Evolving ecosystem

5.3 Iterating

Early days
- Make mistakes
- Learn
- Share
- Do better

5.4 Call to action

Jupyter: Teaching for 2020s
- More visual
- More interactive
- Powerful flows