# Computing Science in Schools

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## Introduction

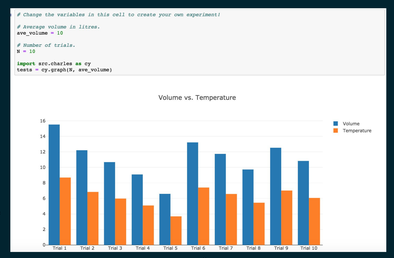
- The goal is to develop learning resources for grades 5-12 oriented around Computing Science
- We utilized Jupyter Notebooks to build lessons with both text and code segments
- Developed in Python 3 and p5.js to have the code be as comprehensible as possible

## The Callysto Project

- Callysto is an initiative by Cybera to develop resources for grades 5-12 with Computing Science concepts integrated and effectively distribute it to teachers and students
- We developed lessons, or notebooks, each focused on a curriculum learning objective for Chemistry 20, CALM 20, Physics 30, and Statistics
- Developed code segments to expose learners to computational thinking and data science
- Implemented answer-checking code on teacher customizable practice questions
- Restructured notebooks into modular series with a comprehensive template according to instructor and peer review

## Computing & Chemistry

```
# Change the variables in this cell to create your own experiment!

# Average volume in litres.
ave_volume = 10

# Number of trials.
N = 10

import src.charles as cy
tests = cy.graph(N, ave_volume)
```



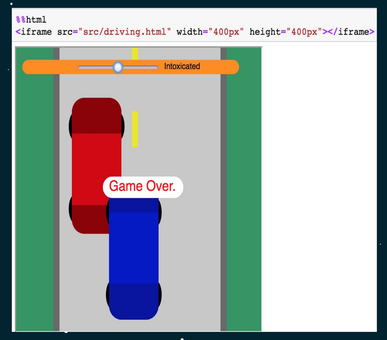

| | Volume | Pressure |
|---|---|---|
| 0 | 6.59 | 3.6904 |
| 1 | 9.09 | 5.0904 |
| 2 | 9.73 | 5.4488 |
| 3 | nan | 5.9808 |
| 4 | 10.83 | 6.0648 |
| 5 | 11.74 | 6.5744 |
| 6 | 12.21 | nan |
| 7 | 12.53 | 7.0168 |
| 8 | nan | 7.4032 |
| 9 | 15.52 | 8.6912 |

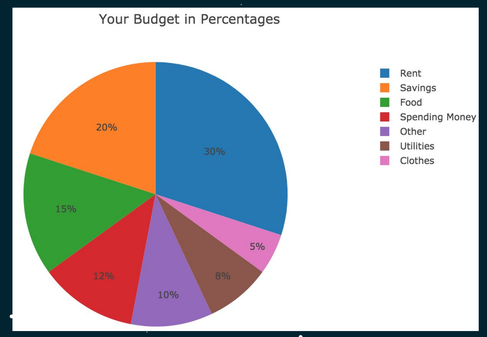
```
init_notebook_mode(connected=True)

# Generates volume bars.
trace1 = go.Bar(
    x=trials,
    y=volumes,
    name='Volume'
)

# Generates temperature bars.
trace2 = go.Bar(
    x=trials,
    y=temps,
    name='Temperature'
)

# Gives graph grouped-bars layout.
data = [trace1, trace2]
layout = go.Layout(
    barmode='group',
    title='Volume vs. Temperature'
)

# Renders graph.
fig = go.Figure(data=data, layout=layout)
py.iplot(fig, filename='grouped-bar')

# Returns list of data for the table.
return tests
```

- Introducing students to data science through simulated experiments from which conclusions can be drawn
- Catering to various types of learners through interactive simulations that illustrate the concepts discussed

## Computing & CALM

```
%%html
<iframe src="src/driving.html" width="400px" height="400px"></iframe>
```




- Gamified educational content to engage students
- Using data science and computational thinking to develop an understanding of important subjects such substance abuse and financial management

## Assessing Concepts

- Empowering teachers to customize practice questions to students' needs
- Introducing students to computational thinking through basic programming

```
%%javascript
//get the button you want to add functionality using ID
var button = $('#button4');
//add function to button
button.click(function(){
                if($('#answer4').is(":visible")){
                    $('#answer4').parent().parent().parent().hide()
                }
                else if($('#answer4').is(":hidden")){
                    $('#answer4').parent().parent().parent().show();
                }
            })


//This hides all divs with classes answers in them
$(document).ready(function() {
    $('.answers').parent().parent().parent().hide();
});
```

```
# Encrypted answer.
answer = '845e85fa64a2d6037055beba19fe0bd8'

# Create answer box.
text = widgets.Text()
display(text)
text.on_submit(check_answer)
```

### Exercise

What is the variance of the data set below? Reorder the code cells using the up and down arrows to the left of the Run button. Leave the START and END cells in their position. The latter will output the final value, which you can check later.

```
#START
values = [1, 2, 3, 4, 5] # Your dataset.
print(values)
```

```
[1, 2, 3, 4, 5]
```

```
value = sum(values)/len(values) #divide the sum of the list of values by the length of the list
print(value)
```

```
3.0
```

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