

Graphical User Interface Programming (Part 1)

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Objectives

- We will cover:
 - Graphical user interface (GUI) programming

Objectives

- More specifically...
- We will cover:
 - “High-level” GUI programming
- We will not cover:
 - “Low-level” GUI programming

Motivation

- **Question:** Why study GUI programming?
- **Answers:**
 - Mainstream “advanced programming”
 - Illustrates event-driven programming
 - Illustrates concurrent programming
 - Important!

Question (lecture06part1)

- What graphical desktop applications do you use frequently?
 - Browse to <https://cos333attend.cs.princeton.edu> to answer

Agenda

- **Introduction to PyQt5**
- GUI programming in COS 333
- PyQt5 widgets
- PyQt5 layout managers

Intro to PyQt5

- *Qt*
 - Haavard Nord and Eirik Chambe-Eng
 - Trolltech, Nokia, The Qt Company



Intro to PyQt5

- *PyQt5*
 - Phil Thompson
 - Riverbank Computing
 - A “Python binding” of Qt

Intro to PyQt5

- **Question:** Why study PyQt5?
 - Instead of some other GUI library?
- **Answers:**
 - Built upon (the very popular) Qt
 - Well designed, stable, robust
 - Written in Python

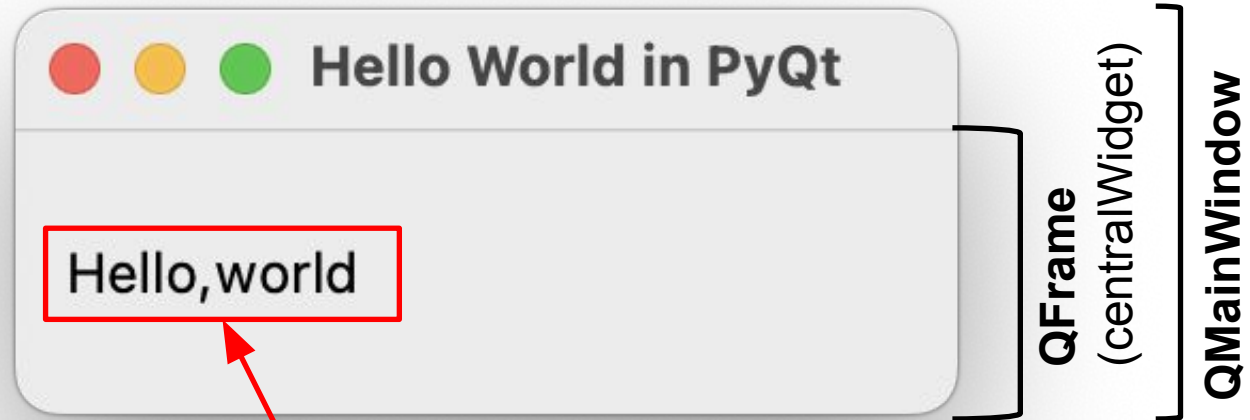
Intro to PyQt5

- **PyQt5** \approx *PySide2*
- In COS 333:
 - **Write** PyQt5 code
 - **Read** PyQt5 or PySide2 docs

Intro to PyQt5

- See [hellopyqt.py](#)

```
$ python hellopyqt.py
```



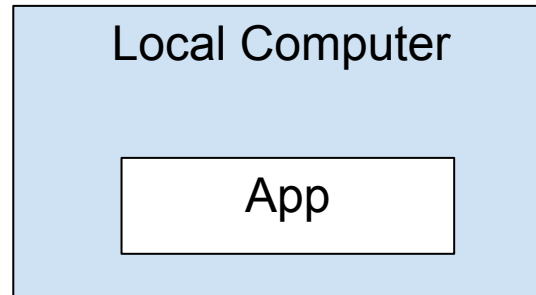
QLabel

Agenda

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- **GUI programming in COS 333**
- PyQt5 widgets
- PyQt5 layout managers

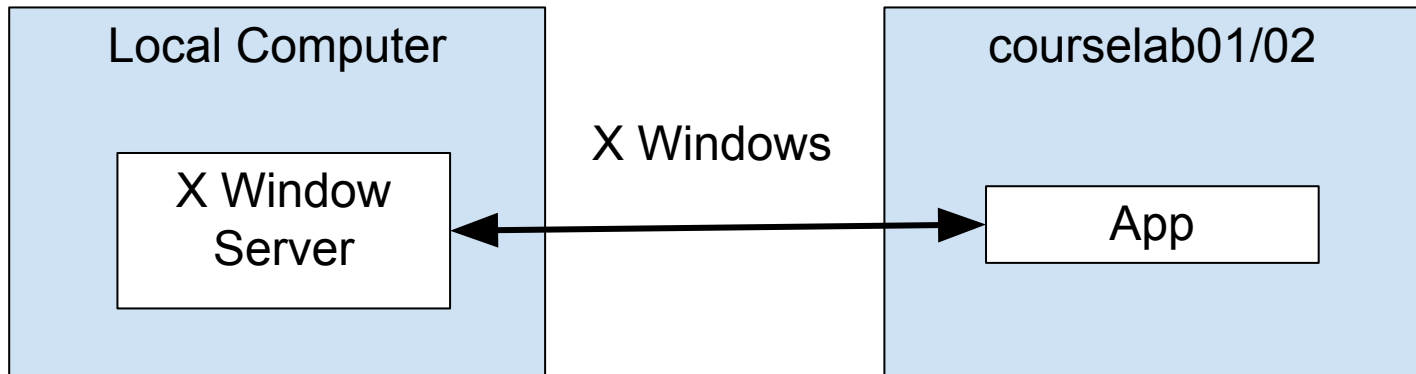
GUI Pgmming in COS 333

Option 1: Run on your computer



GUI Pgmming in COS 333

Option 2: Run on courselab



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- **PyQt5 widgets**
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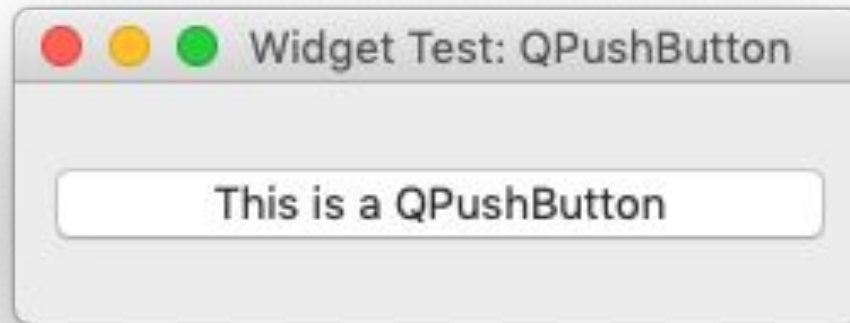
PyQt5 Widgets

- See [widgetqlabel.py](#)



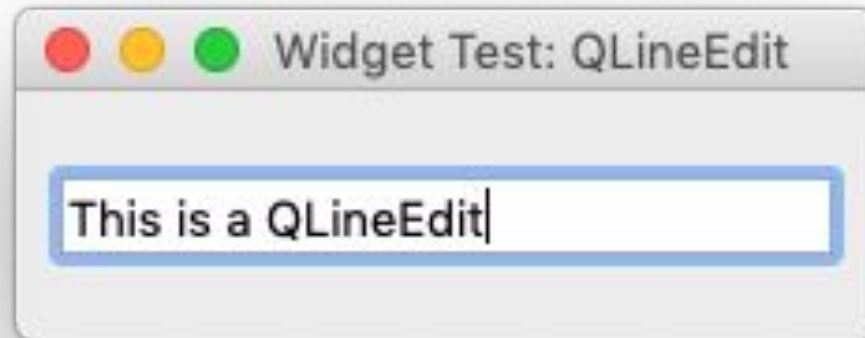
PyQt5 Widgets

- See [widgetqpushbutton.py](#)



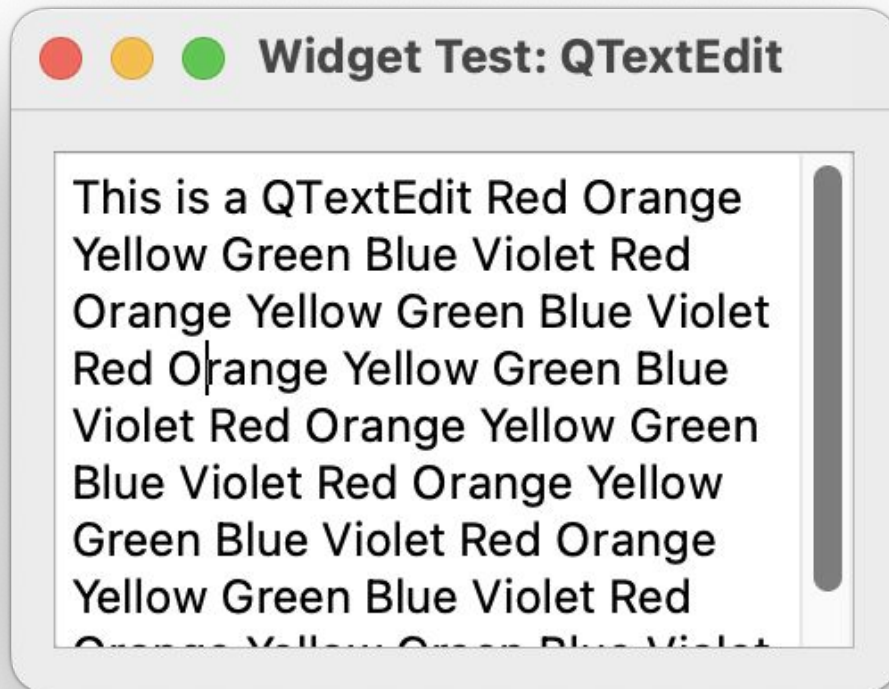
PyQt5 Widgets

- See [widgetqlineedit.py](#)



PyQt5 Widgets

- See [widgetqtextedit.py](#)



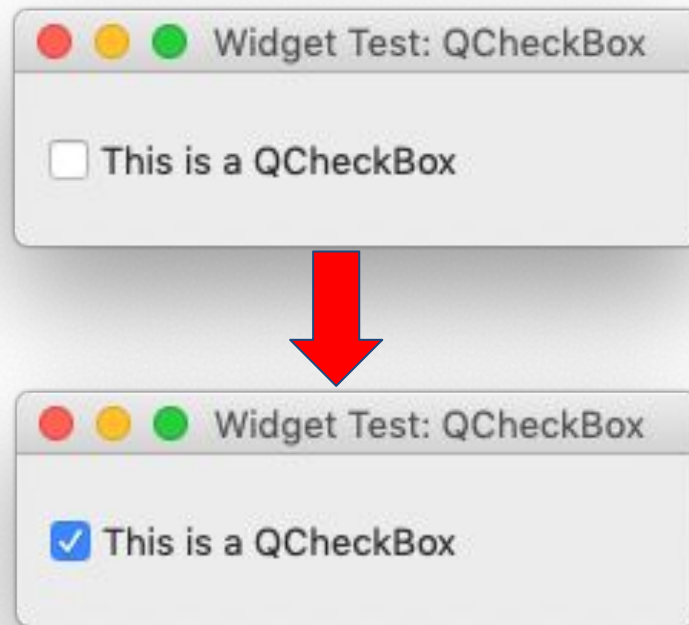
PyQt5 Widgets

- See [widgetqslider.py](#)



PyQt5 Widgets

- See [widgetqcheckbox.py](#)



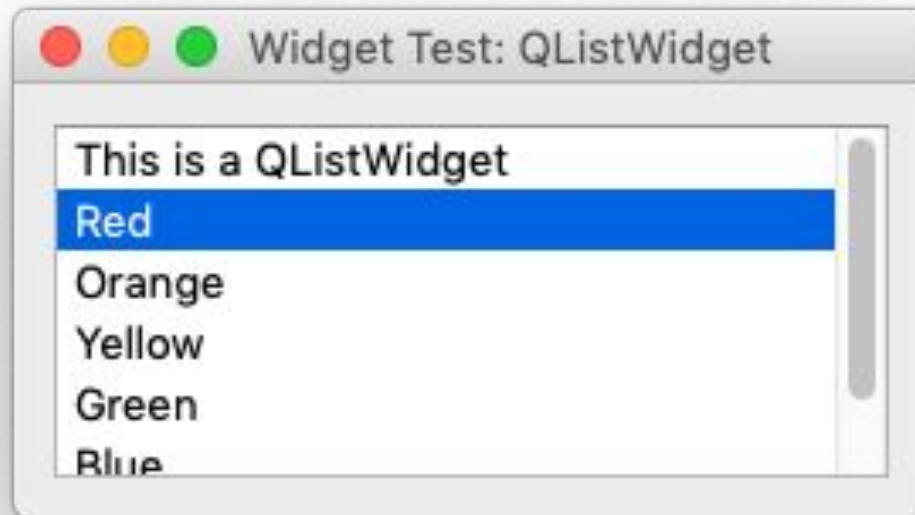
PyQt5 Widgets

- See [widgetradiobuttons.py](#)



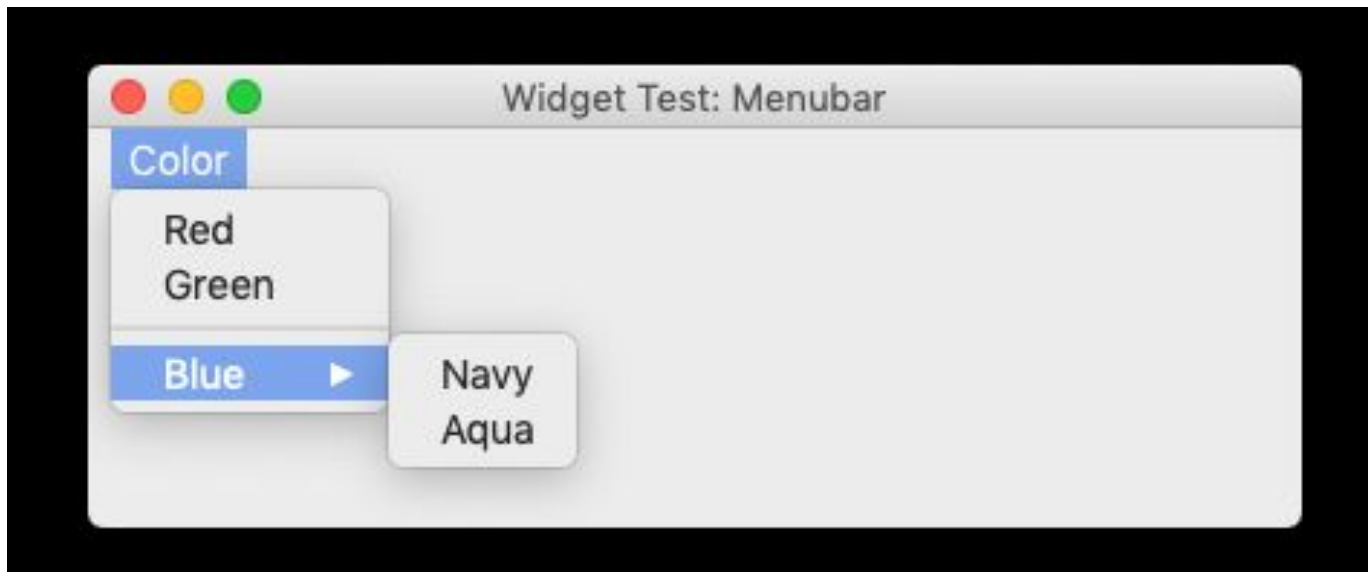
PyQt5 Widgets

- See [widgetqlistwidget.py](#)



PyQt5 Widgets

- See [widgetmenubar.py](#)



PyQt5 Widgets

Conceptual Widget	Relevant PyQt5 Classes
Container	QMainWindow, QFrame
Button	QPushButton
Label	QLabel
Text field	QLineEdit
Text area	QTextEdit
Scrolling text area	QTextEdit
Slider	QSlider
Check box	QCheckBox
Radio button	QRadioButton
List box	QListWidget
Scrolling list box	QListWidget

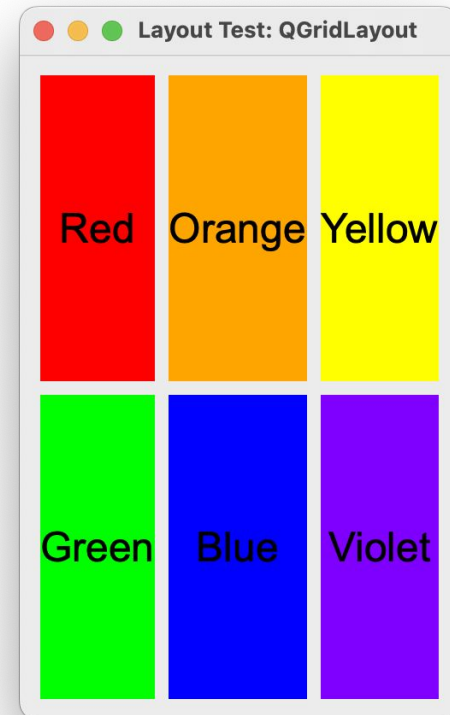
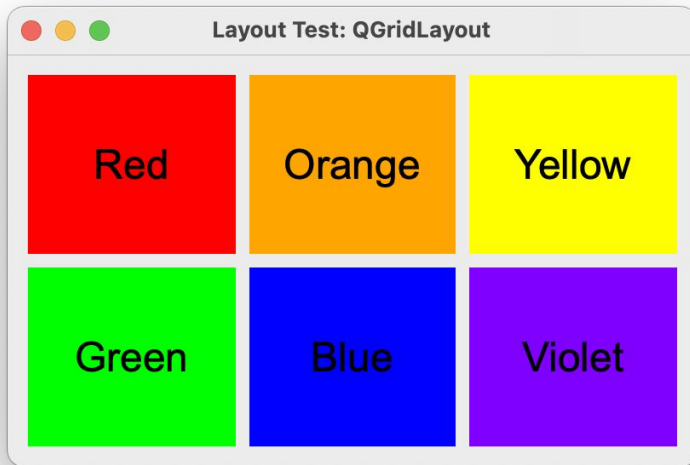
And many many more

Agenda

- Introduction to PyQt5
- GUI programming in COS 333
- PyQt5 widgets
- **PyQt5 layout managers**

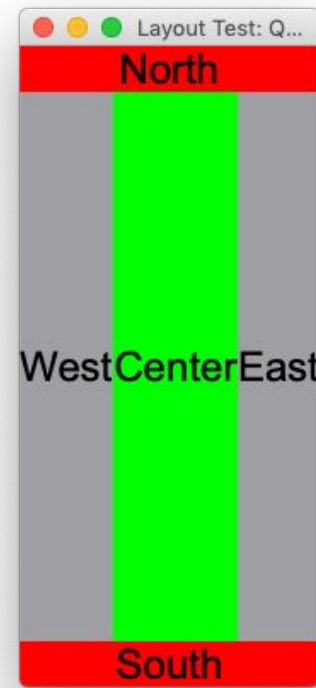
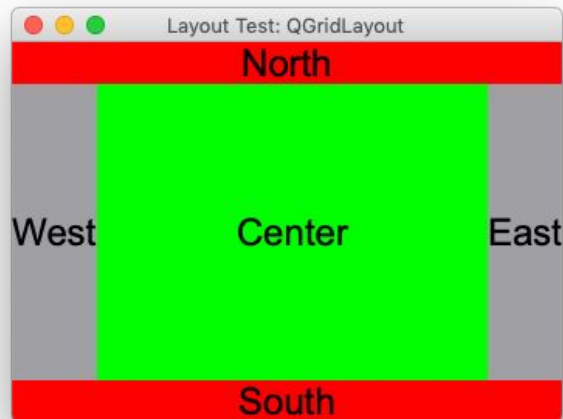
PyQt5 Layout Managers

- See [layoutgrid.py](#)



PyQt5 Layout Managers

- See [layoutgridstretch.py](#)



PyQt5 Layout Managers

See [layoutgridstretch.py](#) (cont.)

```
layout.setRowStretch(0, 1)  
layout.setRowStretch(1, 1)  
layout.setRowStretch(2, 1)
```

All 3 rows expand/contract
up & down at the same rate

```
layout.setRowStretch(0, 1)  
layout.setRowStretch(1, 2)  
layout.setRowStretch(2, 1)
```

Row 1 expands/contracts
up & down at twice the rate
of rows 0 and 2

```
layout.setRowStretch(0, 0)  
layout.setRowStretch(1, 1)  
layout.setRowStretch(2, 0)
```

Rows 0 and 2 don't
expand/contract up &
down; row 1 does

PyQt5 Layout Managers

See [layoutgridstretch.py](#) (cont.)

```
layout.setColStretch(0, 1)
layout.setColStretch(1, 1)
layout.setColStretch(2, 1)
```

All 3 cols expand/contract side-to-side at the same rate

```
layout.setColStretch(0, 1)
layout.setColStretch(1, 2)
layout.setColStretch(2, 1)
```

Col 1 expands/contracts side-to-side at twice the rate of cols 0 and 2

```
layout.setColStretch(0, 0)
layout.setColStretch(1, 1)
layout.setColStretch(2, 0)
```

Cols 0 and 2 don't expand/contract side-to-side; col 1 does

PyQt5 Layout Managers

```
QObject & QLayoutItem
  QLayout
    QBoxLayout
    QFormLayout
    QGridLayout
    QHBoxLayout
    QStackedLayout
    QVBoxLayout
```

Summary

- We have covered:
 - Introduction to PyQt5
 - GUI programming in COS 333
 - PyQt5 widgets
 - PyQt5 layout managers