Environment

Jupyter Notebooks, Linux commands, GPU Computing

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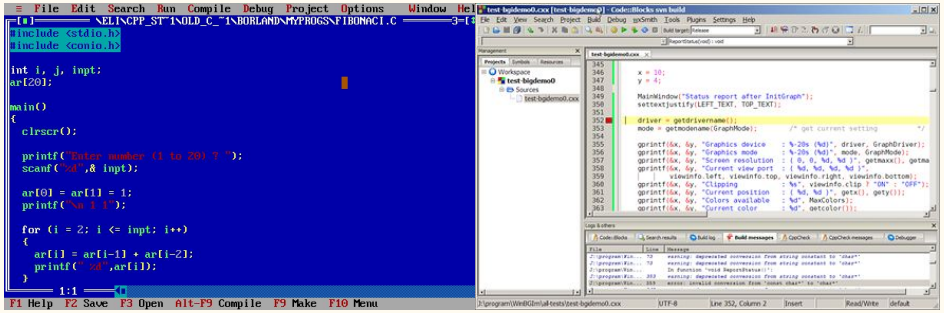
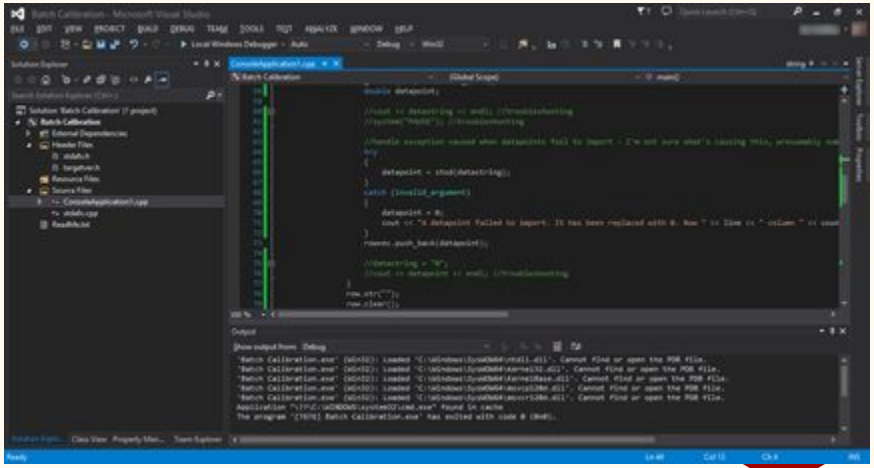
What is a programming environment?

- Hardware and software used by a programmer

Software Examples

1. TurboC++ (Outdated)
2. Visual Studio
3. RStudio
4. Jupyter Notebook
5. Sublime Text





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jupyter Assignment 1 (unsaved changes)

Logout

File Edit View Insert Cell Kernel Widgets Help

Not Trusted | Python 3

Run Code

In [0]:
```
def display_old_new(img, dst, descp='Default Descp'):
    '''
    Display two images side-by-side for comparision

    Params:
    @img - numpy array - 1 channel, Image 1
    @dst - numpy array - 1 channel, Image 2
    @descp - str, Description of Image 2
    '''
    plt.subplot(121),plt.imshow(img, cmap='gray'),plt.title('Original')
    plt.xticks([]), plt.yticks([])
    plt.subplot(122),plt.imshow(dst, cmap='gray'),plt.title(descp)
    plt.xticks([]), plt.yticks([])
    plt.show()
```

Using OpenCV

Image convolution

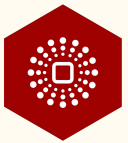
In [3]:
```
FILE_LOCATION = './lena_gray.png'

img = cv2.imread(FILE_LOCATION, 0)

kernel = np.array([[-2,-1,0],
                   [-1,1,1],
                   [0,1,2]])

%time dst = cv2.filter2D(img,-1,kernel)

display_old_new(img, dst, 'Emboss')
```

```
CPU times: user 239 µs, sys: 1.05 ms, total: 1.29 ms
```

Jupyter Notebooks

Python and R environment

- Scripting languages
- Interpreted vs. Compiled
- Can be broken down into parts and executed separately



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Python Kernel

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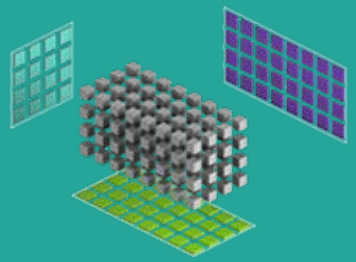
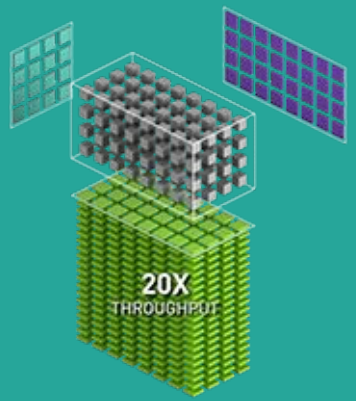
Basic Linux Commands

- ls
- cd
- rm
- &&
- mkdir
- cat
- sudo
- mv, cp

NVIDIA V100 FP32



NVIDIA A100 Tensor Core TF32 with Sparsity



GPU Computing

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What is a GPU?

- graphics processing unit
- Supports matrix operations
- Speeds up parallel computation

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ \vdots \\ m \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & \dots & n \end{array} \\ \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ a_{31} & a_{32} & \dots & a_{3n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \end{array}$$

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	GEFORCE RTX 2080 FOUNDERS EDITION	GEFORCE RTX 2080
	Product Spec	Reference Spec
GPU Engine Specs:		
NVIDIA CUDA® Cores	**2944**	**2944**
Boost Clock (MHz)	**1800(OC)**	**1710**
Base Clock (MHz)	**1515**	**1515**

# of Cores	8
# of Threads	16
Processor Base Frequency	3.60 GHz
Max Turbo Frequency	5.00 GHz

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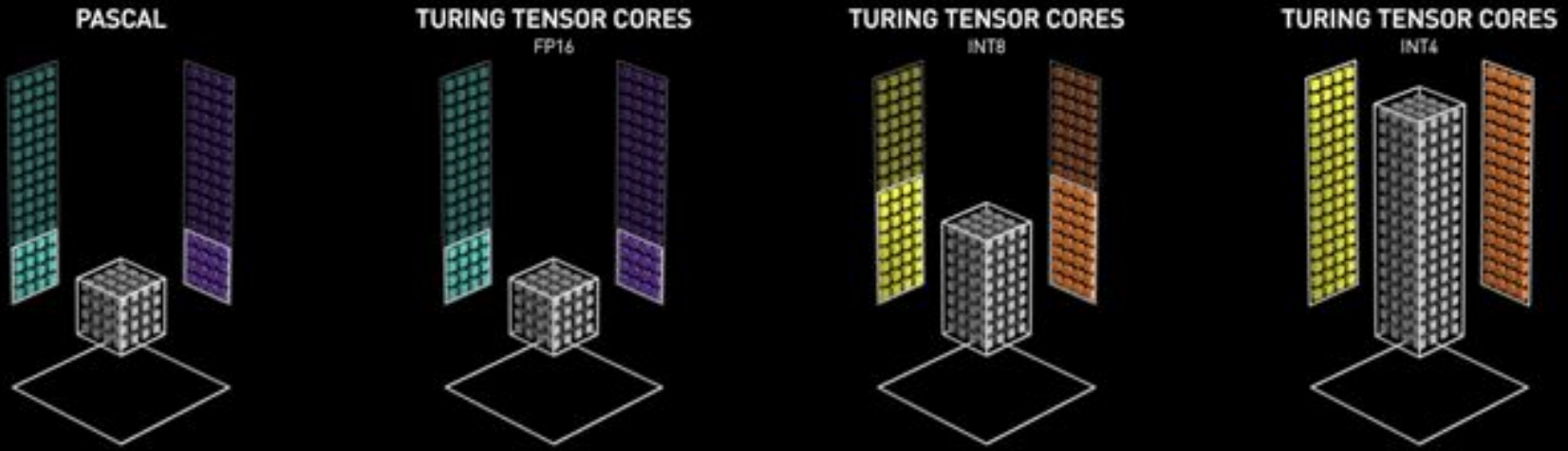

Matrix Operations