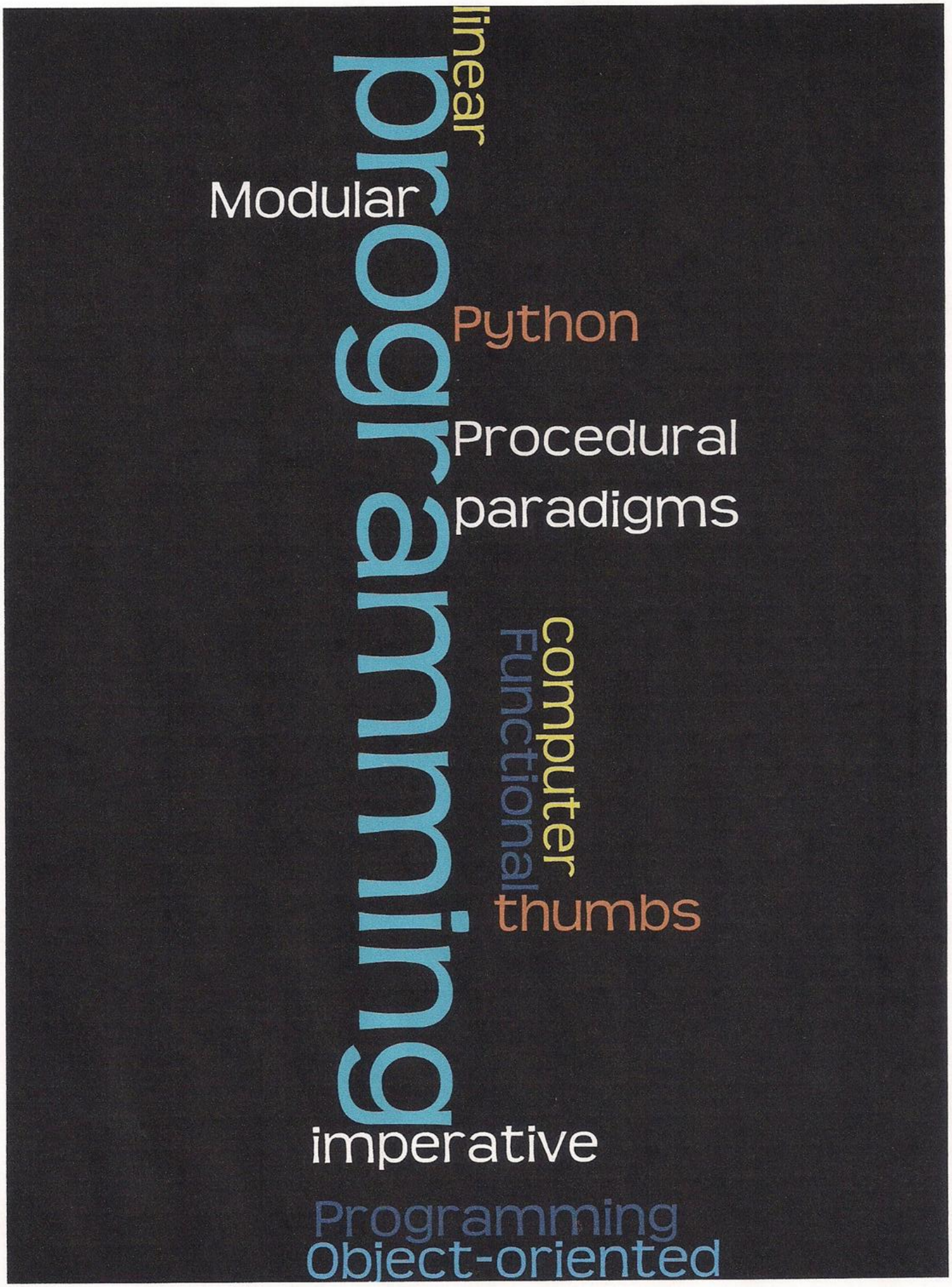
Professor Reed
presents
to
PyOhio 2015
August 2nd
@1400 hrs

Making the "Best Decisions" in Python from the Very Beginning

Where we are all headed !

- My Background & Info
- Using Python IFs effectively
- Going Forward with Your Python Coding


linear
Modular
programming
Python
Procedural
paradigms
computer
Functional
thumbs
imperative
Programming
Object-oriented

Making the "Best Decisions" in Python from the Very Beginning

Edit this proposal Cancel this proposal

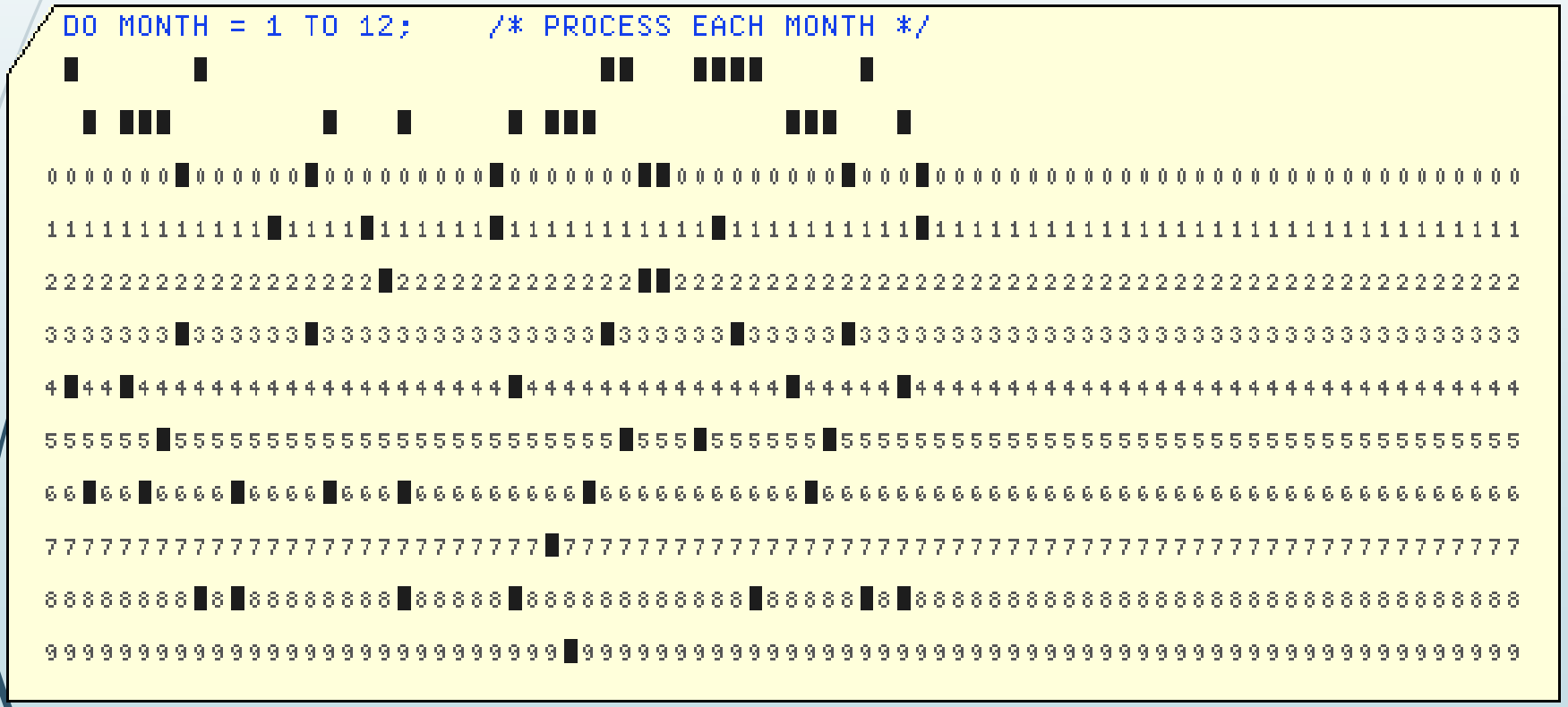
#229: Making the "Best Decisions" in Python from the Very Beginning (James Reed, Track:)

Proposal Details | Supporting Documents | Reviewer Feedback 0

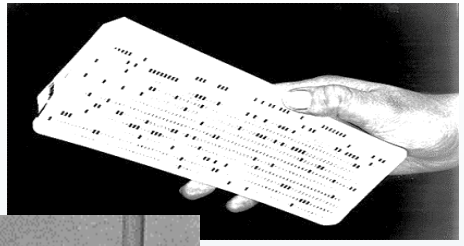
Submitted by	James Reed
Track	
Audience L...	
Description	A refocus of my presentation on "Making Even Better Decisions in Python -- Using IFs with Supporting Assertions" (see below in additional notes)--now geared towards the beginning Python Programmer or those wishing to sharpen their skills at making the best decisions in their python coding correctly from the start of their very next python project.
Abstract	This talk is for both brand new Python programmers as well as the old

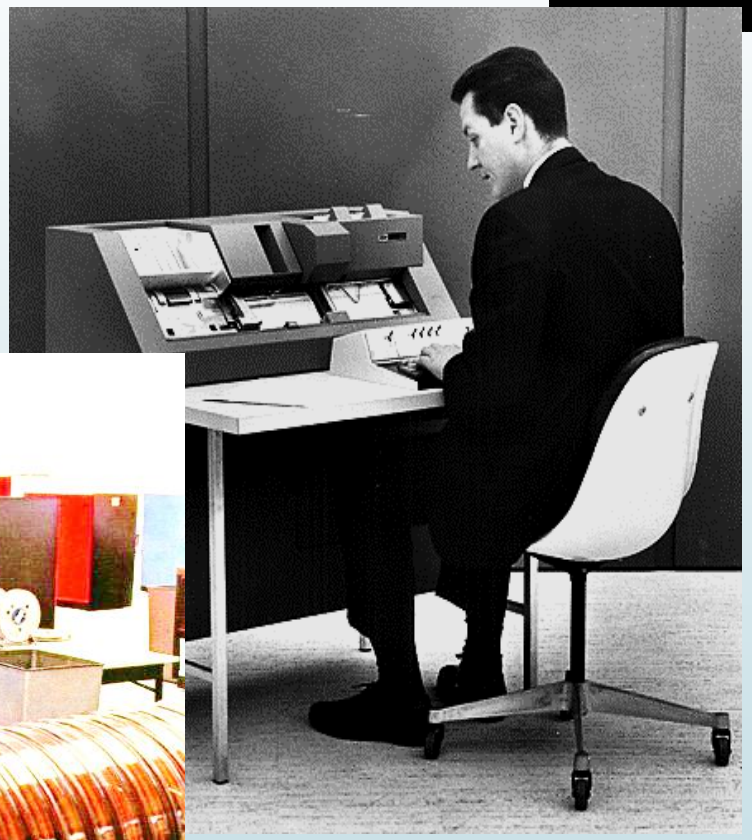
But what does he really know about “modern” Computing???

IBM Hollerith Punch Card

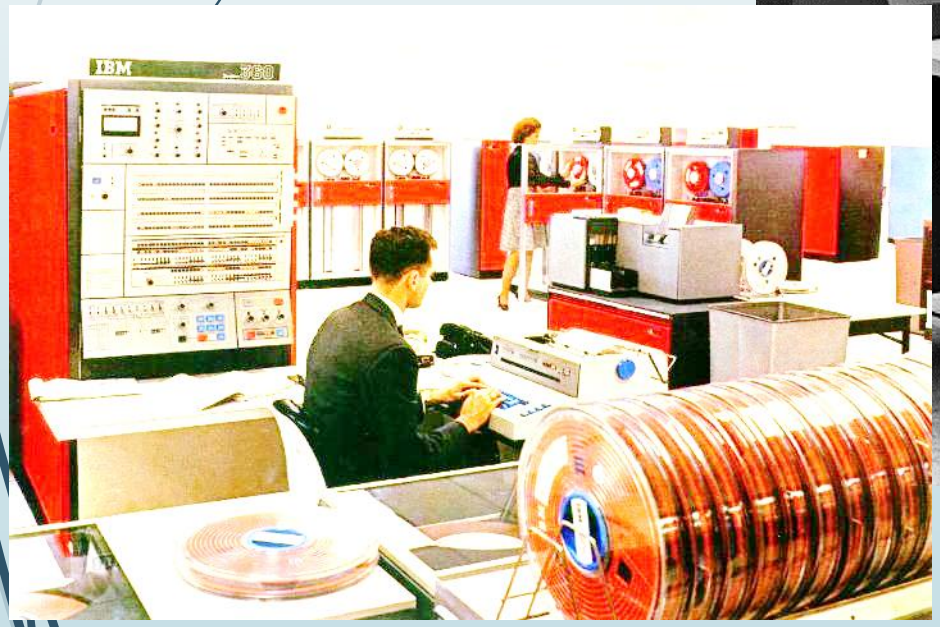


Early Computing





Baker Systems Engineering



IBM 360 MF

Demonstrating at OETC 2015

RT

Coming to OETC 2016 – Python Robotics!

Making the "Best Decisions" in Python

Starting Out Right With Python IFs

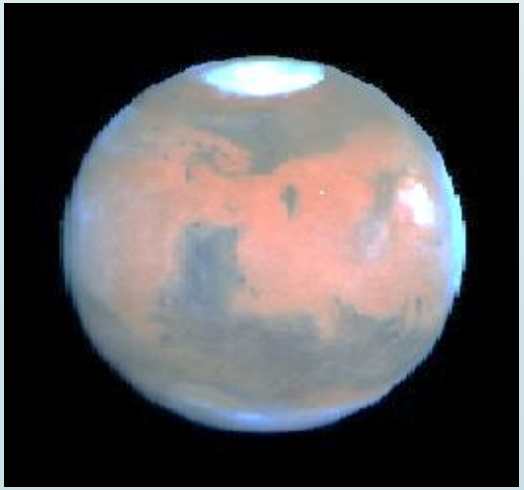
Begin Part 1

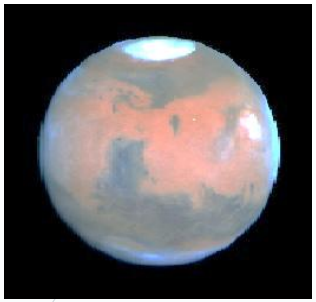
Syntax Free Method of Developing Decisions

Making the "Best Decisions"

What are we $$$ paid to do (Academic vs Business)?

- Make good & correct decisions in Python Computer Programs
- Let's look at a Poor Decision – **"Mars Polar Lander"**





Mars Polar Lander Lost!

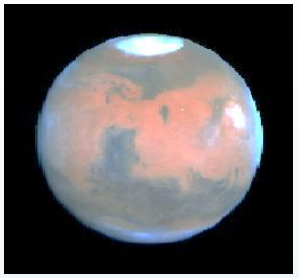
(CNN) -- NASA lost a $125 million Mars orbiter because a Lockheed Martin engineering team used English units of measurement while the agency's team used the more conventional metric system for a key spacecraft operation, according to a review finding released Thursday.

The units mismatch prevented navigation information from transferring between the Mars Climate Orbiter spacecraft team at Lockheed Martin in Denver and the flight team at NASA's Jet Propulsion Laboratory in Pasadena, California.

Space craft declared lost on Dec. 3rd, 1999

Update this is NOT what happened!
Prof. Reed, April 2015

Making the "Best Decisions"



Why did Mars Polar Lander fail?

Investigators of the mishap later pinpointed the most likely cause of the failure. The leading candidate: creation of spurious signals when the craft's legs were deployed during descent.

On-board brains of the lander took the faulty signals as indication that touchdown on Mars had taken place. Software then commanded the craft's set of braking engines to turn off.

Making the "Best Decisions"

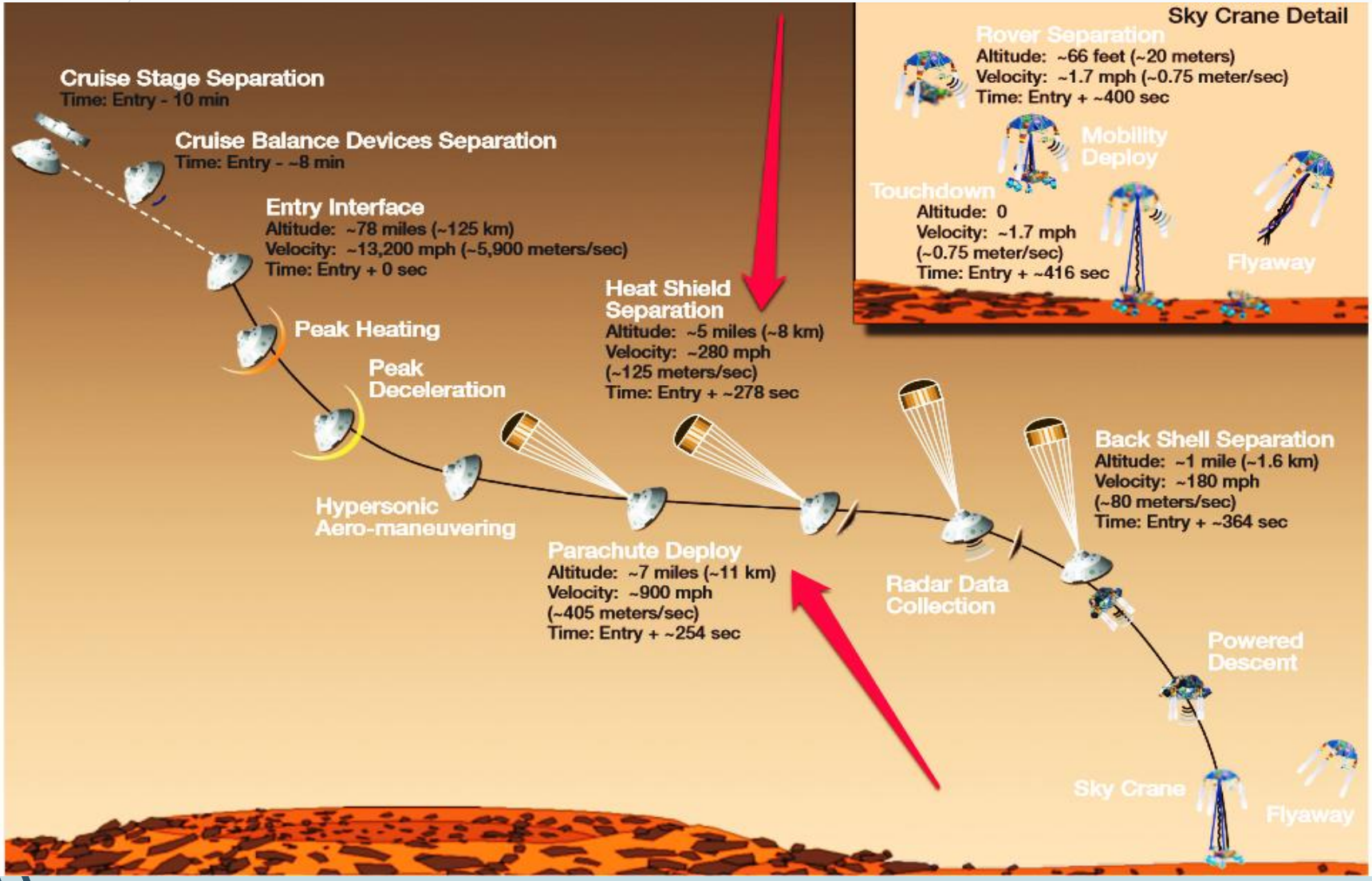
What are we $$$ paid to do (Academic vs Business)?

- Make **good & correct** decisions in Python Computer Programs
- Let's look at a Great Decision – **"Mars Curiosity Lander"**

Our Premise today: Hurdling towards Mars Landing Site at 200 mph+ with drag shoot deployed!!!

Making the "Best Decisions"

Our Premise once again: Hurdling towards Mars Landing Site at 200 mph+ with drag shoot deployed!!!



Making the "Best Decisions"

http://www.jpl.nasa.gov/video/details.php?id=1090

The Angry Red Planet
1959

Making the "Best Decisions"

A complicated landing

The $2.5-billion MSL spacecraft launched from Cape Canaveral, Florida, on Nov. 26, 2011, and **arrived on Mars on Aug. 6, 2012**, after a daring landing sequence that NASA dubbed

"Seven Minutes of Terror."

***Our Premise again:* Our Space Craft Hurdling towards Mars Landing Site at 200 mph+ with drag shoot deployed!!!**

MSL – Mars Science Laboratory

Making the "Best Decisions"

Dec. 5, 2014. Orion launched on its first test flight at 7:05 am

What I said at OETC 2014, " ...are you students ready—not will your students be ready"

Are You?

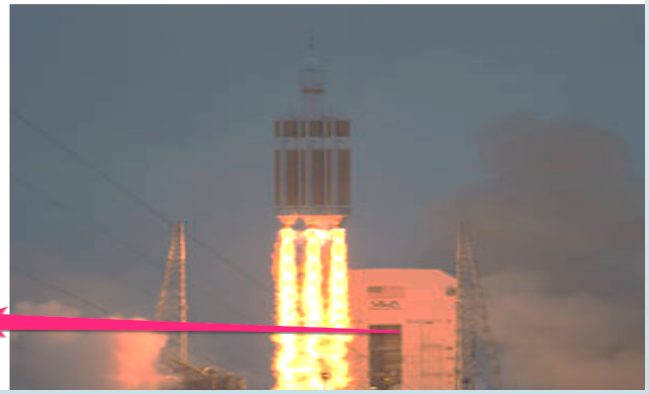
"...can we afford another failed Mars landing with humans aboard??? (estd: to be in 2025)

Major Milestone on Agency's Journey to Mars

NASA marked a major milestone Friday on its journey to Mars as the Orion spacecraft completed its first voyage to space, traveling farther than any spacecraft designed for astronauts has been in more than 40 years.

"Today's flight test of Orion is a huge step for NASA and a really critical part of our work to pioneer deep space on our Journey to Mars," said NASA Administrator Charles Bolden. "The teams did a tremendous job putting Orion through its paces in the real environment it will endure as we push the boundary of human exploration in the coming years."

Orion blazed into the morning sky at 7:05 a.m. EST, lifting off from Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida on a United Launch Alliance Delta IV Heavy rocket. The Orion crew module splashed down approximately 4.5 hours later in the Pacific Ocean, 600 miles southwest of San Diego.



During the uncrewed test, Orion traveled twice through the Van Allen belt where it experienced high periods of radiation, and reached an altitude of 3,600 miles above Earth. Orion also hit speeds of 20,000 mph and weathered temperatures approaching 4,000 degrees Fahrenheit as it entered Earth's atmosphere.

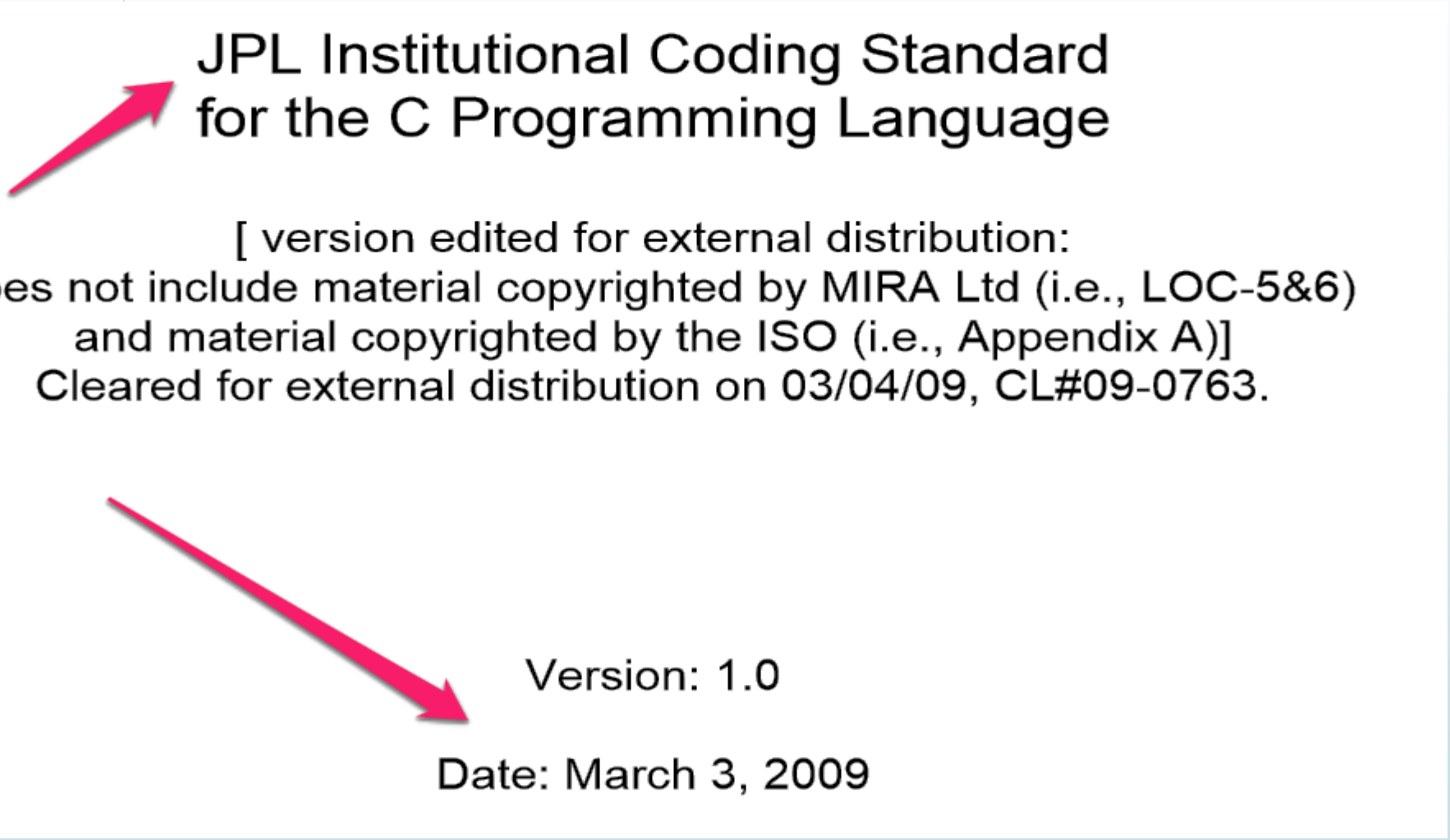
Orion will open the space between Earth and Mars for exploration by astronauts. This proving ground will be invaluable for testing capabilities future human Mars missions will need. The spacecraft was tested in space to allow engineers to collect

http://www.nasa.gov/content/nasas-orion-flight-test-and-the-journey-to-mars

Premise: Hurdling towards Mars Landing Site at 200 mph+ with drag shoot deployed!!!

Making the "Best Decisions"

http://lars-lab.jpl.nasa.gov/JPL_Coding_Standard_C.pdf



Making the "Best Decisions"

Over 25,000 lines of Python Code was used as testing scripts
in the C-code
dispatched to the Mars Lander.

Update???
Note: Ask Prof. Reed about the C-code, reported as 500,000 lines.

Professor Reed sez:

“Computer Language Programming

is

The Business of Dealing

with

Failure!!!”

The “thumbers”!

This is **NOT** computer programming!

Making the "Best Decisions"

- Looking at Your Python IFs

NASA/JPL STANDARDS

Now with this as a backdrop in our program decision making in Python—let's examine some Python Code together.

Premise today: Still Hurdling towards
Mars Landing Site at 200 mph+ with drag shoot deployed!!!

Mars Curiosity: Facts and Information

by Elizabeth Howell, Space.com Contributor | March 26, 2015 11:58pm ET

972 Share 328 Tweet 133 Submit

An artist's concept illustrates what the Mars rover Curiosity will look like on the Red Planet.
Credit: NASA/JPL-Caltech View full size image

The Mars Science Laboratory and its rover centerpiece, Curiosity, is the most ambitious Mars mission yet flown by NASA. The rover's primary mission is to find out if Mars is, or was, suitable for life. Another objective is to learn more about the red planet's environment.

[For the latest news about the mission, follow Space.com's Mars Science Lab Coverage.]

Making the "Best Decisions"

Decision Patterns

Syntax Free Method of Developing Decisions

A) IF *this* THEN Do S1

B) IF *this* THEN
Do S1
ELSE
Do S2

Not Extensible

Cascade Effect

C) IF *this* THEN Do S1
ELSE_IF this Do S2
ELSE_IF this Do S3
ELSE_IF this Do S4
ELSE_IF this Do S5
ELSE
Finality ("otherwise or final item")

IF Pattern 'C'

- **More Reliable**
- **More Extensible**
- **More Flexible**
- **Future Focused**
- **Limits Side-Effects**

Making the "Best Decisions"

Select Decision Pattern 'C'

Syntax Free Method of Developing Decisions

IF *this* THEN Do S1
ELSE_IF this Do S2
ELSE_IF this Do S3
ELSE_IF this Do S4
ELSE_IF this Do S5
ELSE
Finality 'otherwise'
("when all else fails!!!!!")

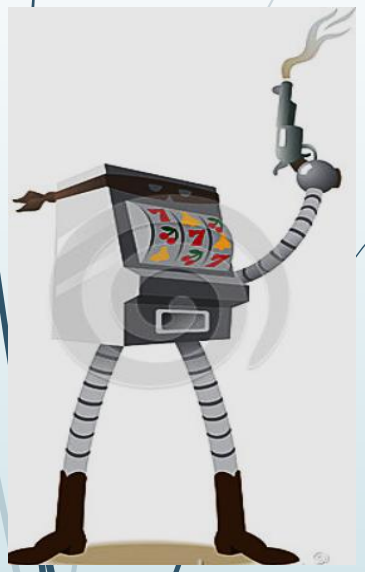
Cascade Effect

Satisfies NASA/JPL STDS

Do what's most important first!!!

Syntax Free Method of Developing Decisions

Making the "Best Decisions"



```
### Begin Ifs in Python:
##
### Python ifs presented by Professor Reed
### last updated (20-APR-2015)
### for Python 3.4+
### Featured Speaker -- Python User Group -- Apr. 2015
##
##
##import string

def simpleIf(x):
    print("Demo Simple IF Demo*: ")
    if x < 0:
        print("simple if test ran:", x)
        print("x is less than 0")
    print("end of Simple IF Demo*: ")
    print ("*** Doesn't meet NASA/JPL Stds, WHY? ***")
    print()
```

Exact only!

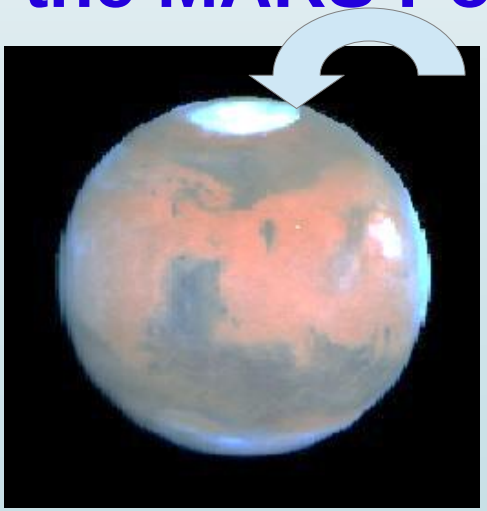
Let's go examine some live code together!

Making the "Best Decisions"

So what have we determined so far?

What does the NASA/JPL STDS say about dangling IF logic???

Remember the MARS Polar Lander!!!



Making the "Best Decisions"

Expanded & Improved!!!

```
IF (x < 0)  THEN “x is negative”
    ELSE_IF (x == 0)
        “x equals zero”
    ELSE_IF (x > 0)
        “x is greater than  zero”
ELSE
        “otherwise clause”
```

Remember: Python Syntax is “elif”

Making the "Best Decisions" in Python

Using **Asserts** Right Out of the Box

Begin Final Part

Exception Handling!!!

Making the "Best Decisions"

Using Asserts Properly

```
========================================= ERRORS =========================================
_____________________ ERROR collecting aprdemoAsserts01.py _____________________
aprdemoAsserts01.py:90: in <module>
    testMyIfs(x)
aprdemoAsserts01.py:79: in testMyIfs
    simpleIf(x)     ## first demo   -- simple if test
aprdemoAsserts01.py:16: in simpleIf
    assert(x < 99)
E   assert 101 < 99
------------------------------ Captured stdout -------------------------------
[negative value test1:]

x is:  101

the value of x is:  101

Demo Simple IF Demo*:
x is:,  101
=============================== 1 error in 0.08 seconds ==========================

jimsbiggirl@jimsbiggirl-PC /cygdrive/c/users/jimsbiggirl/documents
```

Sample CGWIN Run

$ py.test aprdemoAsserts01.py

Making the "Best Decisions"
Using Asserts Properly

Why Do Assertions at ALL???

Satisfies NASA/JPL STDS

Rule 16 (use of assertions)
Assertions shall be used to perform basic sanity checks throughout the code. All functions of more than 10 lines should have at least one assertion. [Power of Ten Rule 5]

Rule 5: The assertion density of the code should average to a minimum of two assertions per function.
Assertions are used to check for anomalous conditions that should never happen in real-life executions.

RT

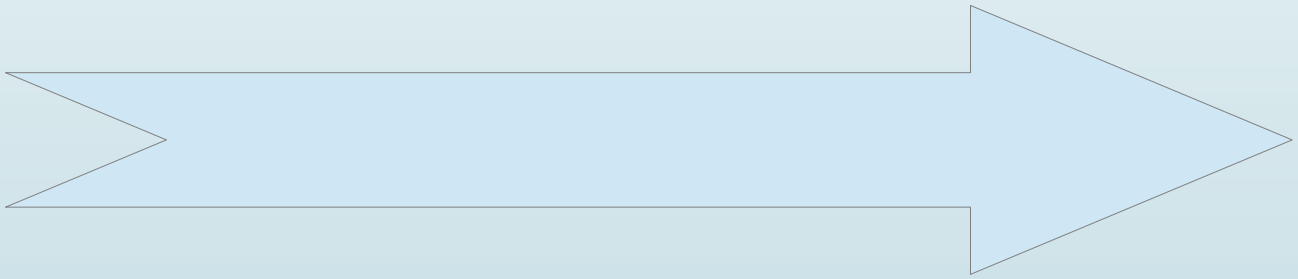
Assertions must always be ***side-effect free*** and should be defined as Boolean tests.

The Power of Ten – **Rules for Developing Safety Critical Code**
Gerard J. Holzmann
NASA/JPL
Laboratory for Reliable Software

Making the "Best Decisions"

Using Asserts Properly

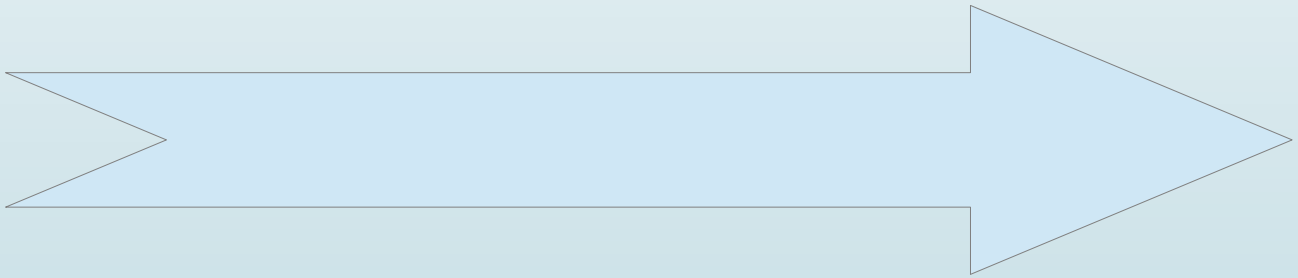
Let's Go Examine Some More Python Code with IFs and Asserts!



Making the "Best Decisions"

Using Asserts Properly

Assertstwo.ipynb



Making the "Best Decisions"
Using Asserts Properly

- **Any Questions???**
- **Any Ideas???**
- **Any Comments???**

End
of Part 3!

Making Still Even Better Decisions In Python

In Final Summary!

- Syntax Free Method of Developing Decisions
- Coding Python IFs effectively
- Going Forward with Your Python Coding

Thanks, Prof. JRR

End of Presentation
on

Making the "Best Decisions"

In Python

###

Thanks again, Prof. JRR

Any Supporting Code and/or notes for this Presentation will be made available on **GitHub**.

Please download **MyTeachBuddy Hybrid Phone App** and be
Kind & Generous in your reviews.

Please don't install it and then delete it later,
It creates terrible stats on the
Mobile App Store Sites.

Sad Comment on the Airbus A320 Tragic Flight

We have seen command codes being used
without voice input bypassing the vocal biometric safeguards.

Kirk does this against the **Reliant**, dropping their shields.

What the locked out A320 Captain might have needed to override his rogue Co-Pilot in the cockpit !!!

Other Resources!

GITHUB

https://github.com/profjrr

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