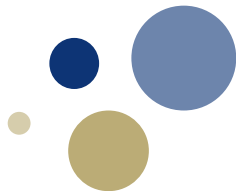




Norwegian University of  
Science and Technology



## **Version control for researchers**

Sigurd Hofsmo Jakobsen

Department of electric power engineering

June 21, 2018



# Outline

Taking over some old code and fixing it

Version control using git

Making the code more readable

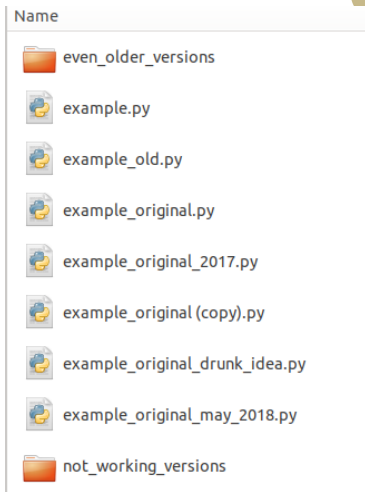
More topics to be considered

Discussion



# Presentation of the case

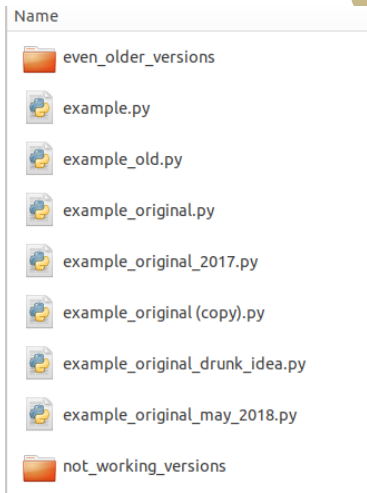
- Some master students are going to continue the work of a PhD





## Presentation of the case

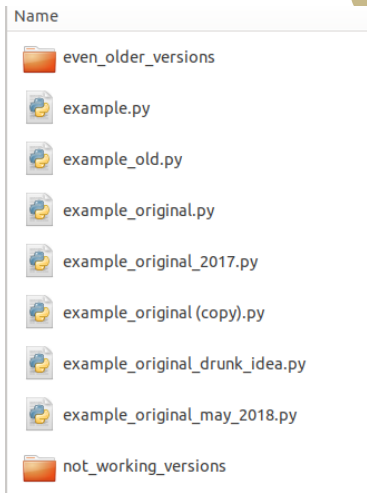
- Some master students are going to continue the work of a PhD
- They received several files on a USB stick (don't tell the it guy)





## Presentation of the case

- Some master students are going to continue the work of a PhD
- They received several files on a USB stick (don't tell the it guy)
- There are no explanation on what the files do





# Presentation of the case

- Some master students are going to continue the work of a PhD
- They received several files on a USB stick (don't tell the it guy)
- There are no explanation on what the files do
- Looking at one of the files doesn't help

```
import csv
import os
a = "../data"
b = "blood_thirsty_janitors.csv"
with open(os.path.join(a, b)) as cf:
    r = csv.DictReader(cf)
    temp_1 = 0
    temp_2 = 0
    temp_3 = 0
    temp_4 = 0
    for rr in r:
        temp_1 += int(rr["beard length"])
        temp_2 += int(rr["churches burned"])
        temp_3 += int(rr["age"])
        temp_4 += 1
a_b_l = temp_1/temp_4
cbl = temp_2/temp_1
aa = temp_3/temp_4
print("calculations done")
b = "evil_vikings.csv"
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print("calculations done")
```



## Problems which have to be solved

— How do they share the code with each other?



## Problems which have to be solved

- How do they share the code with each other?
  - With version control.





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  - Implement and follow code style guidelines



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  - Implement and follow code style guidelines
- How do prevent copy paste?



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  - With version control.
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- How do they make the code readable
  - Implement and follow code style guidelines
- How do prevent copy paste?
  - Create functions.



# Outline

Taking over some old code and fixing it

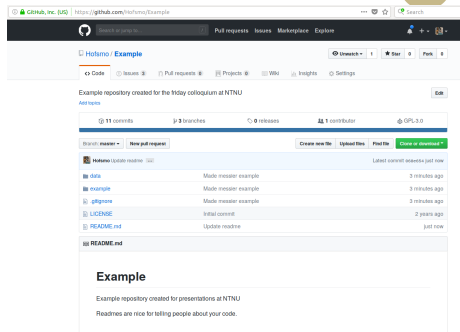
Version control using git

Making the code more readable

More topics to be considered

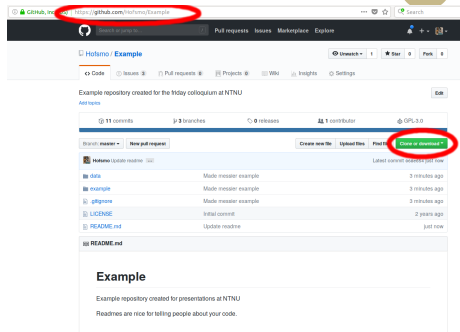
Discussion

— The code can easily be shared online on GitHub

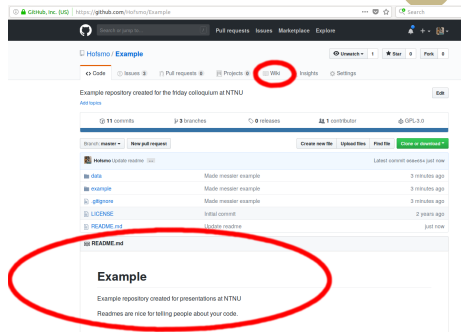




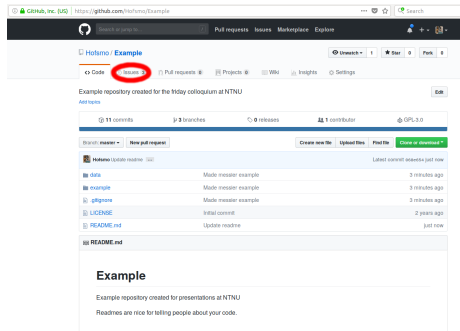
- The code can easily be shared online on GitHub
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- The code can easily be shared online on GitHub
- Everyone can access and download the code
- Readme and wiki for documenting the code



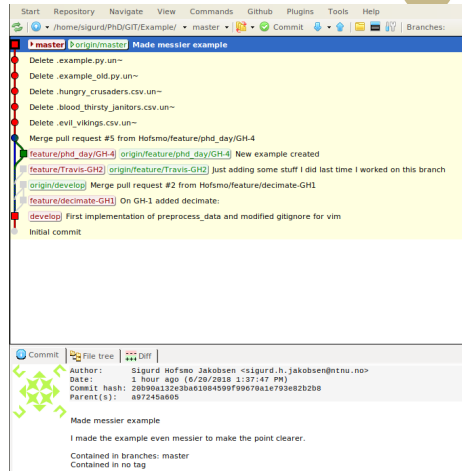
- The code can easily be shared online on GitHub
- Everyone can access and download the code
- Readme and wiki for documenting the code
- Issue tracker for reporting bugs and discussing the code





# Getting rid of the old files using git

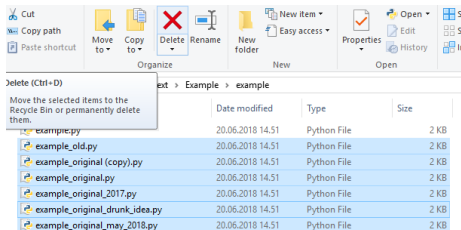
- Download the GitHub repository using a GUI or the terminal.





# Getting rid of the old files using git

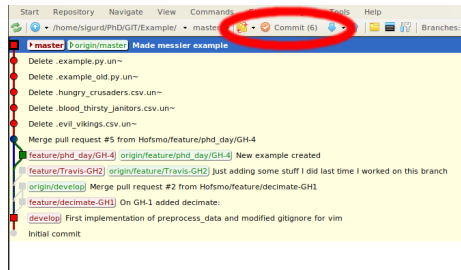
- Download the GitHub repository using a GUI or the terminal.
- Find the files and delete them.





## Getting rid of the old files using git

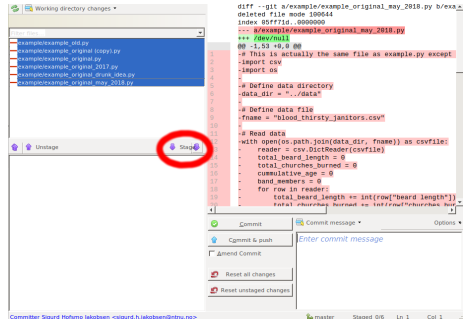
- Download the GitHub repository using a GUI or the terminal.
- Find the files and delete them.
- The GUI informs you that changes have been made.





# Getting rid of the old files using git

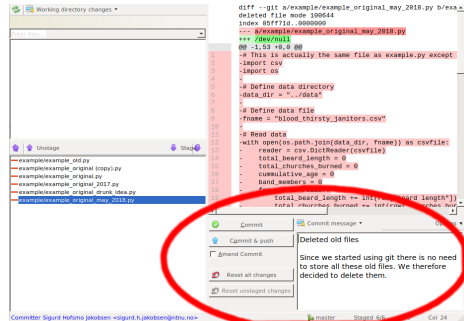
- Download the GitHub repository using a GUI or the terminal.
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- The GUI informs you that changes have been made.
- The changes have to be staged.





# Getting rid of the old files using git

- Download the GitHub repository using a GUI or the terminal.
- Find the files and delete them.
- The GUI informs you that changes have been made.
- The changes have to be staged.
- Write a commit message and commit the change.

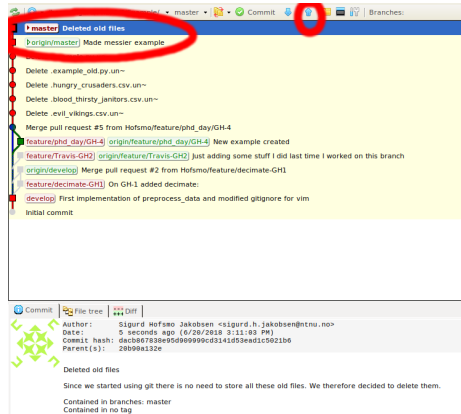






# Getting rid of the old files using git

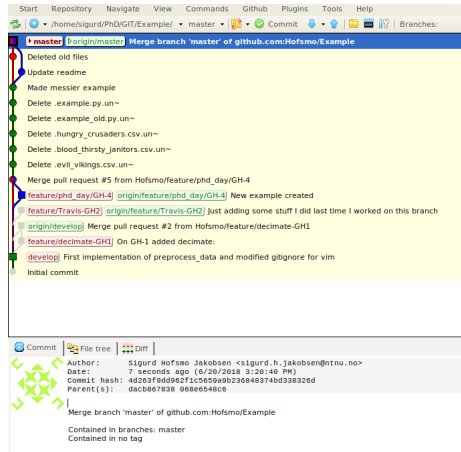
- Download the GitHub repository using a GUI or the terminal.
- Find the files and delete them.
- The GUI informs you that changes have been made.
- The changes have to be staged.
- Write a commit message and commit the change.
- Our local version is now ahead of the GitHub version and the changes can be pushed.





# Getting rid of the old files using git

- Download the GitHub repository using a GUI or the terminal.
- Find the files and delete them.
- The GUI informs you that changes have been made.
- The changes have to be staged.
- Write a commit message and commit the change.
- Our local version is now ahead of the GitHub version and the changes can be pushed.
- The versions are now identical





# Outline

Taking over some old code and fixing it

Version control using git

**Making the code more readable**

More topics to be considered

Discussion



# General tips on making code better

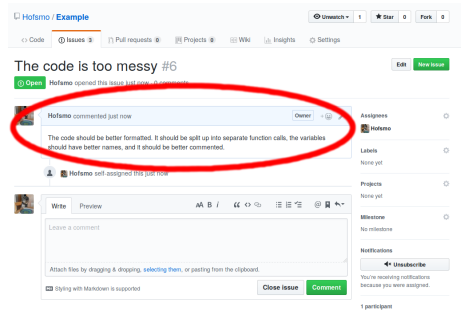
- Use descriptive variable names
- Have some space in between lines
- Write comments
- Write docstrings
- Don't copy and paste code

```
import csv
import os
a = "../data"
b = "blood_thirsty_janitors.csv"
with open(os.path.join(a, b)) as cf:
    r = csv.DictReader(cf)
    temp_1 = 0
    temp_2 = 0
    temp_3 = 0
    temp_4 = 0
    for rr in r:
        temp_1 += int(rr["beard length"])
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with open(os.path.join(a, b)) as cf:
```



# Using the GitHub issue tracker

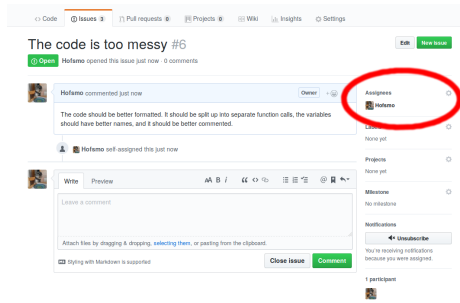
## — Write a descriptive issue





# Using the GitHub issue tracker

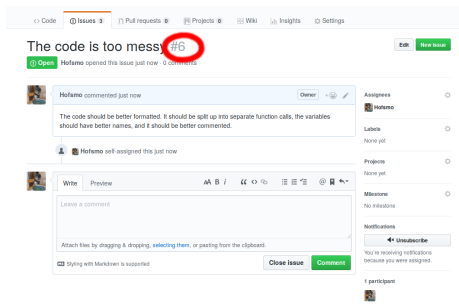
- Write a descriptive issue
- You can make someone responsible for fixing the issue





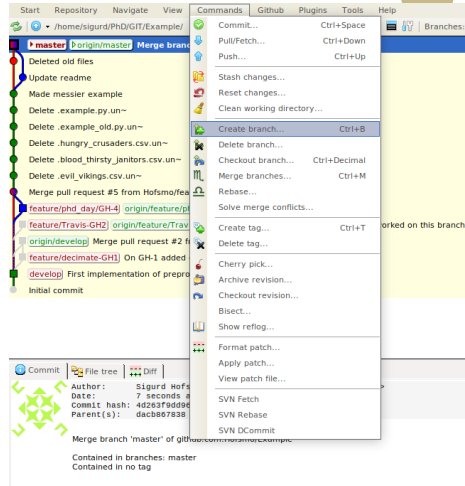
# Using the GitHub issue tracker

- Write a descriptive issue
- You can make someone responsible for fixing the issue
- The issue get a number you can use for referencing it



# Using git for fixing the code

— Create a branch for the issue







# Using git for fixing the code

- Create a branch for the issue
- Give the branch a good name

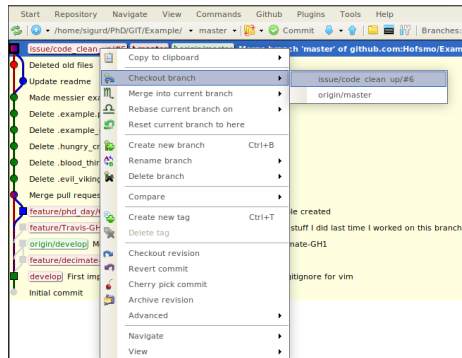
The screenshot shows a 'Create branch' dialog box with the following fields and options:

- Branch name:** `issue/code_clean_up/#6`
- Create branch at this revision:** `4d263f9dd9` (with a commit icon and an equals sign)
- Checkout after create:** ☐
- Orphan:**
  - ☐ Create orphan
  - ☒ Clear working directory and index
- Buttons:** [Help](#) (with a question mark icon) and [Create branch](#) (with a green plus icon)



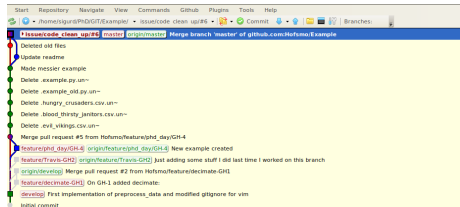
# Using git for fixing the code

- Create a branch for the issue
- Give the branch a good name
- Checkout the branch



## Using git for fixing the code

- Create a branch for the issue
- Give the branch a good name
- Checkout the branch
- We are now ready to clean up the code





# Using git for fixing the code

- Create a branch for the issue
- Give the branch a good name
- Checkout the branch
- We are now ready to clean up the code
- After the code is clean reference the issue in the commit message

The screenshot shows a Git IDE interface. The top pane displays a diff view comparing a file 'a/example/example.py' with 'b/example/example.py'. The diff shows several changes, including the addition of a docstring, imports, and a function 'clean\_up' that reads a CSV file and calculates the average of 'beard length' and 'age' columns. The bottom pane shows the commit message 'Cleaned up the code' and a description of the changes made.


```
diff --git a/example/example.py b/example/example.py
index 22f6c26..3fba2e2 100644
+++ b/example/example.py
@@ -1,51 +1,54 @@
+"""Read in hand beard lengths and calculating relation
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```



# Using git for fixing the code

- Create a branch for the issue
- Give the branch a good name
- Checkout the branch
- We are now ready to clean up the code
- After the code is clean reference the issue in the commit message
- We can now see the commit message in GitHub

## The code is too messy #6

 Open Hofsmo opened this issue an hour ago · 0 comments



Hofsmo commented an hour ago

Owner



The code should be better formatted. It should be split up into separate function calls, the variables should have better names, and it should be better commented.



Hofsmo self-assigned this an hour ago



Hofsmo added a commit that referenced this issue 18 seconds ago



Cleaned up the code [\[diff\]](#)

323a924

I cleaned up the code by giving good variable names, writing comments, creating a function and writing descriptions.

done on issue #6



# What clean up did I do on the code

— Added a docstring to the file

```

1  """Read in band beard lengths and calculate relation to church burnings."""
2  import os
3
4
5  def read_file_and_do_calculations(file_path):
6      """Function for reading band files and do the calculations.
7      INPUT:
8          file_path: The full path to the file
9      Output:
10         nothing
11      """
12
13     # Read the data
14     with open(os.path.join(data_dir, fname)) as csvfile:
15         reader = csv.DictReader(csvfile)
16         total_beard_length = 0
17         total_churches_burned = 0
18         cumulative_age = 0
19         band_members = 0
20         for row in reader:
21             total_beard_length += int(row["beard length"])
22             total_churches_burned += int(row["churches burned"])
23             cumulative_age += int(row["age"])
24             band_members += 1
25
26     # Do the calculations
27     average_beard_length = total_beard_length/band_members
28     churches_per_beard_length = total_churches_burned/total_beard_length
29     average_age = cumulative_age/band_members
30
31     print("Calculations done")
32
33
34 # Define data directory
35 data_dir = "../data"
36
37 # Define data file
38 fname = "blood_thirsty_janitors.csv"
39
40 # Do calculations
41 read_file_and_do_calculations(os.path.join(data_dir, fname))
42
43 # Define data file
44 fname = "evil_vikings.csv"
45
46 # Do calculations
47 read_file_and_do_calculations(os.path.join(data_dir, fname))
48
49 # Define data file

```



# What clean up did I do on the code

- Added a docstring to the file
- Created a function

```

1 """Read in band beard lengths and calculate relation to church burnings."""
2 import csv
3 import os
4
5 def read_file_and_do_calculations(file_path):
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48
49 # Define data file

```



# What clean up did I do on the code

- Added a docstring to the file
- Created a function
- Wrote a docstring for the function

```

1 """Read in band beard lengths and calculate relation to church burnings."""
2 import csv
3 import os
4
5 def read_file_and_do_calculations(file_path):
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48
49 # Define data file

```





# What clean up did I do on the code

- Added a docstring to the file
- Created a function
- Wrote a docstring for the function
- Added proper spacing

```

1 """Read in band beard lengths and calculate relation to church burnings."""
2 import csv
3 import os
4
5 def read_file_and_do_calculations(file_path):
6     """Function for reading band files and do the calculations.
7     INPUT:
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25
26     # Do the calculations
27     average_beard_length = total_beard_length/band_members
28     churches_per_beard_length = total_churches_burned/total_beard_length
29     average_age = cumulative_age/band_members
30
31     print("Calculations done")
32
33
34 # Define data directory
35 data_dir = "../data"
36
37 # Define data file
38 fname = "blood_thirsty_janitors.csv"
39
40 # Do calculations
41 read_file_and_do_calculations(os.path.join(data_dir, fname))
42
43 # Define data file
44 fname = "evil_vikings.csv"
45
46 # Do calculations
47 read_file_and_do_calculations(os.path.join(data_dir, fname))
48
49 # Define data file

```



# What clean up did I do on the code

- Added a docstring to the file
- Created a function
- Wrote a docstring for the function
- Added proper spacing
- Added comments

```

1 """Read in band beard lengths and calculate relation to church burnings."""
2 import csv
3 import os
4
5 def read_file_and_do_calculations(file_path):
6     """Function for reading band files and do the calculations.
7     INPUT:
8         file_path: The full path to the file
9     Output:
10         nothing
11     """
12
13     # Read the data
14     with open(os.path.join(data_dir, fname)) as csvfile:
15         reader = csv.DictReader(csvfile)
16         total_beard_length = 0
17         total_churches_burned = 0
18         cumulative_age = 0
19         band_members = 0
20         for row in reader:
21             total_beard_length += int(row["beard length"])
22             total_churches_burned += int(row["churches burned"])
23             cumulative_age += int(row["age"])
24             band_members += 1
25
26     # Do the calculations
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```



# What clean up did I do on the code

- Added a docstring to the file
- Created a function
- Wrote a docstring for the function
- Added proper spacing
- Added comments
- Made reasonable variable names

```

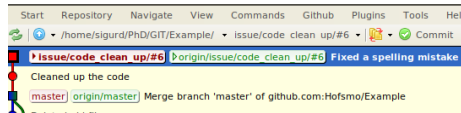
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# Resolving the issue

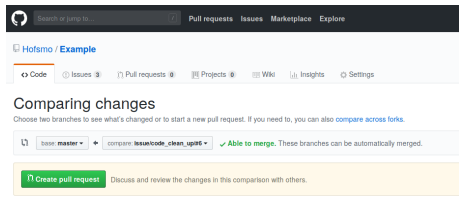
- The code is now clean, and we want the changes in our master branch.





# Resolving the issue

- The code is now clean, and we want the changes in our master branch.
- GitHub automatically checks if the changes are compatible.



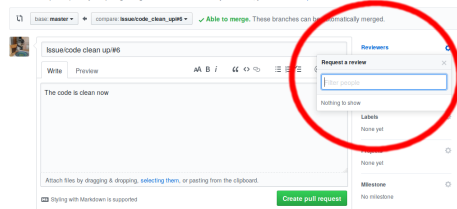


# Resolving the issue

- The code is now clean, and we want the changes in our master branch.
- GitHub automatically checks if the changes are compatible.
- You can ask someone to review your code.

## Open a pull request

Create a new pull request by comparing changes across two branches. If you need to, you can also [compare across forks](#).



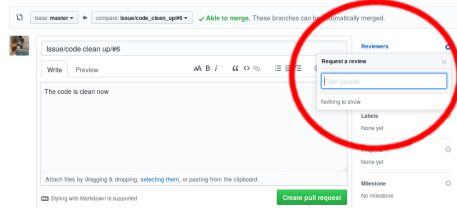


# Resolving the issue

- The code is now clean, and we want the changes in our master branch.
- GitHub automatically checks if the changes are compatible.
- You can ask someone to review your code.
- After the review you can merge your code with the old.

## Open a pull request

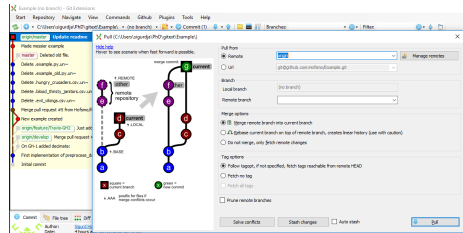
Create a new pull request by comparing changes across two branches. If you need to, you can also [compare across forks](#).





# Another student downloading the changes

- Other students can now get the changes using pull

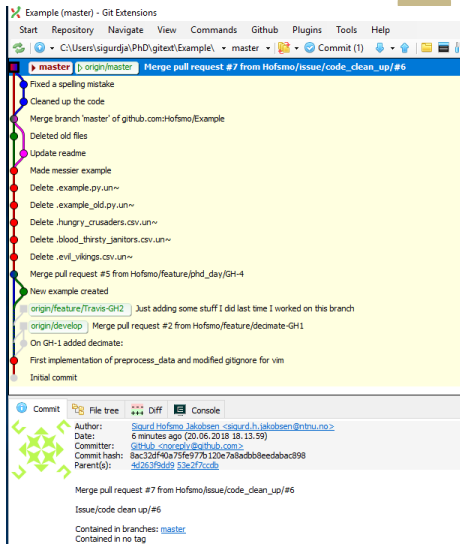






# Another student downloading the changes

- Other students can now get the changes using pull
- Afterwards the changes will be merged and available





# Outline

Taking over some old code and fixing it

Version control using git

Making the code more readable

**More topics to be considered**

Discussion

# GitHub provides organizational pages

The screenshot shows the GitHub page for KTH Royal Institute of Technology. The browser address bar shows the URL `https://github.com/KTH`. The page header includes navigation links: Pull requests, Issues, Marketplace, and Explore. The main header features the KTH logo and the text "KTH Royal Institute of Technology" with a description: "KTH is a leading European technical and engineering university." Below this, statistics show 90 Repositories, 5 People, and 0 Projects. A search bar and filters for Type and Language are present. The repository list includes:

- integral-mecenas-integration**: A Camel route to push information from Ladok3 to Mecenat. Languages: Java, MIT. Updated 18 hours ago.
- flottsbro-web**: Frontend for flottsbro-api. Languages: JavaScript, MIT. Updated 18 hours ago.
- ldfi-akka**: Implementation of LDFI for Akka programs in Scala. Languages: Scala, 9 stars, MIT. Updated 19 hours ago.

On the right side, there are sections for "Top languages" (JavaScript, Java, Python, Shell, Go) and "People" (5 members shown).

# GitHub provides organizational pages

The screenshot shows the GitHub organization page for ALSETLab. The header includes the GitHub logo, a search bar, and navigation links: Pull requests, Issues, Marketplace, and Explore. The organization's profile section displays the ALSETLab logo, the name 'ALSETLab', and a description: 'This organization hosts projects of ALSETLab, Prof. Luigi Vanfretti's research team @ RPI (formerly SmartS Lab @ KTH)'. It also shows the location 'Troy, NY' and the email 'luigi.vanfretti@gmail.com'. Below the profile, there are statistics: 25 Repositories, 2 People, and 0 Projects. The 'Pinned repositories' section lists six repositories:

- RaPid**: A recursive acronym for "Rapid Parameter Identification" utilizes different optimization and simulation technologies to provide a framework for model validation and calibration of any kind ... (Matlab, 16 stars, 9 forks)
- Nordic44-Nordpool**: Nordic44-Nordpool: An Open Data Processing Software Toolset for an Equivalent Nordic Grid Model Matched to Historical Electricity Market Data (Python, 10 stars, 3 forks)
- S3DK**: Smart grid Synchrophasor SDK (S3DK) - A LabVIEW API and a Real-Time Data Mediator for PMU Application Development! (LabVIEW, 6 stars, 1 fork)
- ADN-RT-EMTP-Model**: Active Distribution Network Power System Model for Dynamics, Stability and Control Analysis (4 stars, 3 forks)
- S3DK-STRONGgrid**: Real-time PMU data mediation library with several future functionalities in mind, such as a time-synchronization layer and multithreading - and LabView API (C++, 1 star)
- TRISTAN**: Time-series-based methods to assess power system (static and dynamic) stability margins. (Jupyter Notebook, 2 stars)



# Structuring of packages and toolboxes

- Properly structured packages can easily be installed by others.
- For Python check out `setuptools`
- For Matlab check out their help pages

21 commits
3 branches
0 releases
1 contributor
GPL-3.0

Branch: **master**
New pull request
Create new file
Upload files
Find file
Clone or download

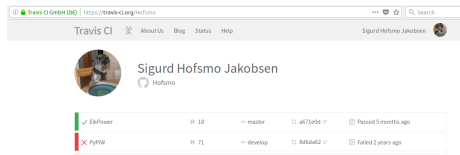
Hofsmo Update readme		Latest commit a671e0d on Jan 23
elkgraf	Added test to check that the grid is connected	5 months ago
examples/simple	Added test to check that the grid is connected	5 months ago
tests	Added test to check that the grid is connected	5 months ago
.gitignore	All files are read	5 months ago
.travis.yml	Added script section to travis	5 months ago
LICENSE	Initial commit	5 months ago
README.md	Update readme	5 months ago
requirements.txt	All files are read	5 months ago
setup.py	All files are read	5 months ago
tox.ini	All files are read	5 months ago

Sigurd Hofsmo Jakobsen (NTNU)
Version control for researchers
June 21, 2018
17 / 20



# Automating code sanity tests

- Code can be tested for guidelines (PEP8)
- The code installation can be tested (tox)
- Unit tests can be done (pytest)
- Documentation can be generated and tested (sphinx)
- Many more options





# Automating code sanity tests

- Code can be tested for guidelines (PEP8)
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- Many more options





# Outline

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Discussion





## Questions for discussion

- How does my code look?
- How do we work with code today? Cooperation? Version control?
- Could my code be useful for others?
- Should the department have a more active approach to the topic?
  - Education?
  - Infrastructure?
  - Who has the responsibility?
- Actions?