

Authenticating to GitHub via SSH

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 Note

This document was originally part of a course titled [Introduction to version Control in R with RStudio, Git, and Github](#).

The course was originally created by [Mike Croucher](#) from [RSE-Sheffield](#) under a [Creative Commons Attribution Share Alike 4.0 International](#). It was subsequently adapted by [Malika Ihle](#) from [Reproducible Research Oxford](#). The overview image is from [Dumitru Uzun](#). You are free to use this work in your own projects.

Minor changes have been made to the document by Jan Simson from LMU Munich to make it available offline.

Secure the connection between your computer and GitHub

When working with a GitHub repository, you'll often need to identify yourself to GitHub using your username and password. There are several ways to secure this connection further. Establishing a secure connection is mandatory since August 2021.

Today we will use **SSH Keys** to secure your identification to GitHub as this is a common way to secure connections, which you may encounter again in other contexts in the future. An SSH key is also an alternate way to identify yourself that doesn't require you to enter your username and password every time.

SSH keys come in pairs, a public key that gets shared with services like GitHub, and a private key that is stored only on your computer. If the keys match, you're granted access.

The procedure below only needs to be executed once per GitHub account and for each computer you will use to connect to GitHub.

Checking for existing SSH key pair

The first step in using SSH authorization with GitHub is to generate your own key pair. However, you might already have an SSH key pair on your machine. You can check to see if one exists by moving to your `~/.ssh` directory and listing the contents.

On windows, open **Git Bash** (start menu -> Git Bash). On MacOS, open the **Terminal** app. On Linux, open your distribution's (or any other) terminal emulator. Enter the following commands one after the other (hitting ENTER after each command).

```
ls ~/.ssh
```

The `ls` command lists the content of a directory, here `~/.ssh`. Check the directory listing to see if you already have a public SSH key. By default, the filenames of the public keys are one of the following:

```
id_rsa.pub id_ecdsa.pub id_ed25519.pub
```

If you do, you can skip the section that generates a SSH key pair, and go to the section 'Adding a new SSH key to your GitHub account'.

If you don't have an existing public and private key pair (which is to be expected!), or if you receive an error that `~/.ssh` doesn't exist, that this file location doesn't exist, or that you can't access this folder, go ahead and generate a new SSH key pair!

Generating an SSH key pair

In the command line, type the following by replacing `your_email@email.com` with your own email address. Pay attention to spaces and capital letter!

```
ssh-keygen -t ed25519 -C "your_email@email.com"
```

This creates a new SSH key pair, using the provided email as a label.

When you're prompted to "Enter a file in which to save the key," press ENTER. This accepts the default file location. This is the prompt that will appear:

```
Generating public/private ed25519 key pair.  
Enter file in which to save the key (/Users/username/.ssh/id_ed25519):
```

You will then be asked to provide a passphrase. Protecting your keys with a password is optional but highly recommended. Note: when you type passwords in the command line, nothing is displayed, not even ***. This is the prompt that will appear:

```
Enter passphrase (empty for no passphrase):  
Enter same passphrase again:
```

When the key generation is complete, you should see the following confirmation:

```
Your identification has been saved in /Users/username/.ssh/id_ed25519.  
Your public key has been saved in /Users/username/.ssh/id_ed25519.pub.  
The key fingerprint is:  
SHA256:6nr/zo0g7Bz7WMRwy34maBhQy1UZyX47gT+egRdlIhs your_email@email.com  
The key's randomart image is:  
+-- [ED25519 256] --+  
|   .o++           |  
|   o oF . o       |  
|   . o+ =.+       |  
|   . + += .       |  
|   . +S++         |  
|   . . .oB=       |  
|   . +**=.        |  
|   o.==* o        |  
|   .o.o+** .      |  
+--- [SHA256] ---+
```

Adding a new SSH key to your GitHub account

We now need to tell GitHub about your public key. Display the contents of your new public key file with `cat`. **Be careful:** do not copy the content of your *private* key, but your *public* key. Your public key ends with `.pub`. Please type the command below exactly as it is, in its entirety:

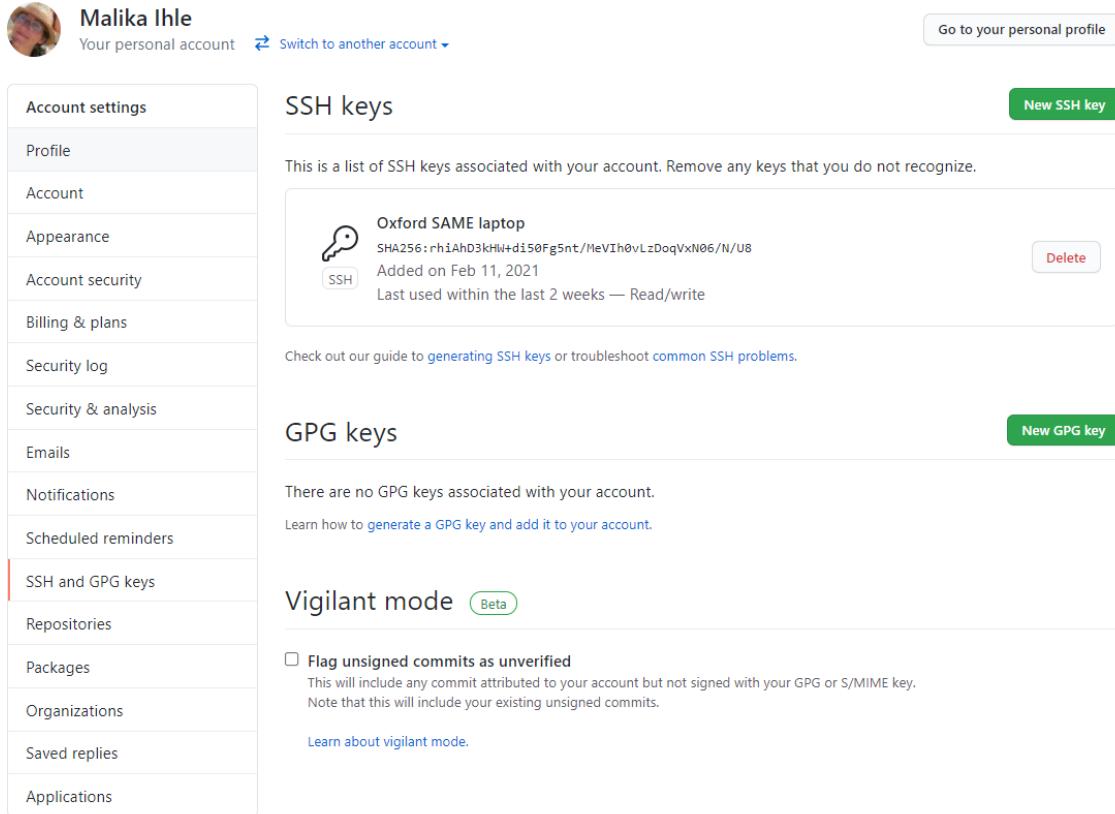
```
cat ~/.ssh/id_ed25519.pub
```

The output should look something like this:

```
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAIFEKiimOpcayfHhlbjmnIBAUX74FY/o20k9yFA16XOLm your_email@email.com
```

Copy the contents of the output to your clipboard.

Login to github.com and bring up your account settings by clicking on your profile photo (top right) and selecting **Settings**. Click on **SSH and GPG keys** (left sidebar), and then click on the green button ‘New SSH key’ or ‘Add SSH key’.



The screenshot shows the GitHub account settings page for a user named Malika Ihle. The left sidebar is a vertical list of account settings, with the 'SSH and GPG keys' option highlighted with a red border. The main content area is titled 'SSH keys' and contains a list of existing SSH keys. One key is shown in detail: 'Oxford SAME laptop' (SHA256: rhiAhD3kHW+di50Fg5nt/MeVlh0vLzDoqVxN06/N/U8), added on Feb 11, 2021, and last used within the last 2 weeks (Read/write). A 'Delete' button is visible next to the key details. Below this, a note says 'Check out our guide to [generating SSH keys](#) or troubleshoot [common SSH problems](#)'. A green 'New SSH key' button is located in the top right of the 'SSH keys' section. The 'GPG keys' section below it shows a note: 'There are no GPG keys associated with your account.' and a link to 'Learn how to [generate a GPG key and add it to your account](#)'. The 'Vigilant mode' section is at the bottom, labeled as 'Beta', with a checkbox for 'Flag unsigned commits as unverified' and a note explaining it will include any commit attributed to the account but not signed with a GPG or S/MIME key. A link to 'Learn about vigilant mode' is provided.

In the “Title” field, add a descriptive label for the new key. For example, if you’re using a personal laptop, you might call this key “Personal MacBook Air”. Finally, paste the contents of your clipboard into the Key text box and hit the green ‘Add key’ button to save. Enter your GitHub password if prompted.

SSH keys / Add new

Title

Key

```
ssh-ed25519 AAAAC3NzaC1I2D11NTESAAAAIEKiimOpcayfHhlbjmnIBAUX74FY/o20k9yFA16XOLm
your_email@email.com
```

Add SSH key

That's it ! Going forward, you can use the SSH clone URL when copying a repo to your local machine (we will cover this in the second tutorial).

Adding your key to the ssh-agent (optional)

Read the following to type your passphrase only once.

If you protected your key with a passphrase, you will be prompted for it every time you use your key. To save you some typing, it is possible to use a piece of software called **ssh-agent** to ask your system to “remember” your key. In practice, this means you only have to type your passphrase once.

Depending on your system, the following might not be necessary. On most GNU/Linux distributions, your key will be automatically added to the **ssh-agent** after the first time you enter it. If you keep getting asked for your key each time you want to clone or push to a GitHub repository, you can follow the following instructions.

In the command line, start the **ssh-agent** with this command:

```
eval "$(ssh-agent -s)"
```

which should display an output similar to something like this:

```
Agent pid 59566
```

Then, add your key to the ssh-agent by typing the entirety of this command:

```
ssh-add ~/.ssh/id_ed25519
```

That's it! You are completely done with the setting up part, which you will need to repeat only if you change computer. Let the fun begin!