

Learning Haskell. For beginners there is a self study course at <https://github.com/system-f/fp-course>. If you want a gentle video class, you could try the Youtube Haskell for dilettantes.

Installing Haskell. On linux or mac, install Haskell with `ghcup`, from

```
https://www.haskell.org/ghcup/install/
```

Then you can upgrade and check the installation with

```
% ghcup upgrade
% ghcup tui
```

In the tui display, one check means installed, two checks mean set for use. Generally, I set the versions listed as ‘recommended’ in that display. See <https://www.haskell.org/ghcup/steps/> on using external packages in `ghci`, etc. (On windows-11, I was able to install `ghcup` on windows subsystem ubuntu, just as in a standard linux, after first installing: `build-essential findutils binutils curl gcc g++ libgmp-dev libc-dev libffi-dev make musl-dev ncurses-dev perl tar xz-utils`.)

Optional: Literate Haskell To process literate Haskell files (*.lhs), install `lhs2tex` and `unlit`, used to produce this documentation:

```
% stack install unlit
% stack install lhs2tex
```

Then `unlit` produces Haskell (*.hs) from literate Haskell (*.lhs). For the `installingHaskellEtc.lhs` file I am editing now,

```
% unlit -i installingHaskellEtc.lhs -o installingHaskellEtc.hs
```

For code documentation, line-by-line, `lhs2tex` produces a latex file for generating pdf, the pdf which you are presumably looking at now. This file, `installingHaskellEtc.pdf`, is produced and opened with these steps:

```
% lhs2tex -o installingHaskellEtc.tex installingHaskellEtc.lhs
% pdflatex -shell-escape installingHaskellEtc.tex
% open installingHaskellEtc.pdf
```

Here in the pdf format, the Haskell code which is now in `installingHaskellEtc.hs` looks like this:

```
main :: IO ()
main = putStrLn "Hello, world!"
```

For code publication, the Haskell code in `installingHaskellEtc.hs` can be much more colorful and perhaps more beautiful with `minted`:

```
main :: IO ()
main = putStrLn "Hello, world!"
```

The `-shell-escape` flag for `pdflatex` is required to use the `minted` package.

Also optional: tmux+neovim with haskell language server Nvim provides easy connection with language servers for syntax highlighting, code completion, etc. (In emacs, I found this harder to do.) Tmux allows you to split screen to run editor plus session (plus anything else) all at once, with easy switching. The combination is a very flexible and extensible IDE, one that is actively used and developed recently.

Ubuntu install Intro youtube vids, useful for those not already familiar with nvim and tmux:

- “Dreams of Code” vid on nvim config and basics
- “Dreams of Code” vid on tmux config and basics

On Ubuntu 24.04, I installed a nerdfont, ripgrep, tmux, tmux package manager (tpm), etc

```
% sudo apt install ripgrep
% sudo apt install nodejs npm
% sudo apt install luarocks
% sudo apt install tmux
% git clone https://github.com/tmux-plugins/tpm ~/.tmux/plugins/tpm
% wget -P ~/.local/share/fonts https://github.com/ryanoasis/nerd-fonts/releases/latest/download/Meslo.zip
% cd ~/.local/share/fonts
% unzip Mezlo.zip
% rm Mezlo.zip
% sudo fc-cache -fv
% sudo npm i -g hls
% sudo npm i -g pyright
% ghcup install hls
% sudo luarocks install haskell-tools
% stack install haskell-dap ghci-dap haskell-debug-adapter
```

Then in a terminal window, in text settings, I selected the Meslo mono font. Then following the instructions here:

<https://nvchad.com/docs/quickstart/install/>

In nvim, when running

```
:MasonInstallAll,
```

you can scroll down to install haskell-language-server and pyright (and whatever else you want). And in nvim, add syntax highlighting for whatever languages you want:

```
:TSInstall haskell
:TSInstall python
:TSInstall texlab
```

Then add these lines to `.config/nvim/init.lua`:

```
require 'lspconfig'.pyright.setup{}
require 'lspconfig'.hls.setup{}
```

And in that same file, inside `require("lazy").setup({ ...})` add

```
{
  'mrcjkb/haskell-tools.nvim',
  version = '^3', -- Recommended
  lazy = false, -- This plugin is already lazy
},
```

Then create dir and file `~/.config/nvim/after/ftplugin/haskell.lua` with contents:

```
-- ~/.config/nvim/after/ftplugin/haskell.lua
local ht = require('haskell-tools')
local bufnr = vim.api.nvim_get_current_buf()
local opts = { noremap = true, silent = true, buffer = bufnr, }
-- haskell-language-server relies heavily on codeLenses,
-- so auto-refresh (see advanced configuration) is enabled by default
vim.keymap.set('n', '<space>cl', vim.lsp.codelens.run, opts)
-- Hoogle search for the type signature of the definition under the cursor
vim.keymap.set('n', '<space>hs', ht.hoogle.hoogle_signature, opts)
-- Evaluate all code snippets
vim.keymap.set('n', '<space>ea', ht.lsp.buf_eval_all, opts)
-- Toggle a GHCi repl for the current package
vim.keymap.set('n', '<leader>rr', ht.repl.toggle, opts)
-- Toggle a GHCi repl for the current buffer
vim.keymap.set('n', '<leader>rf', function() ht.repl.toggle(vim.api.nvim_buf_get_name(0)) end, opts)
vim.keymap.set('n', '<leader>rq', ht.repl.quit, opts)
```

Mac install On Mac, first,

- At the time of this writing (May 2024) something is very wrong with the lua screen and color control for my default Mac terminal, so I installed the kitty terminal, tmux, etc:

```
brew install kitty tmux tpm
```

- I installed all the homebrew nerd fonts:

```
brew tap homebrew/cask-fonts
brew search '/font-.*-nerd-font/' \ensuremath{\backslash Varid{awk}};\text{\ttfamily '\char123 ~print~\char125 '}} xargs -I{} brew install --cask {}
```

- I installed ripgrep, haskell-language-server, debug tools

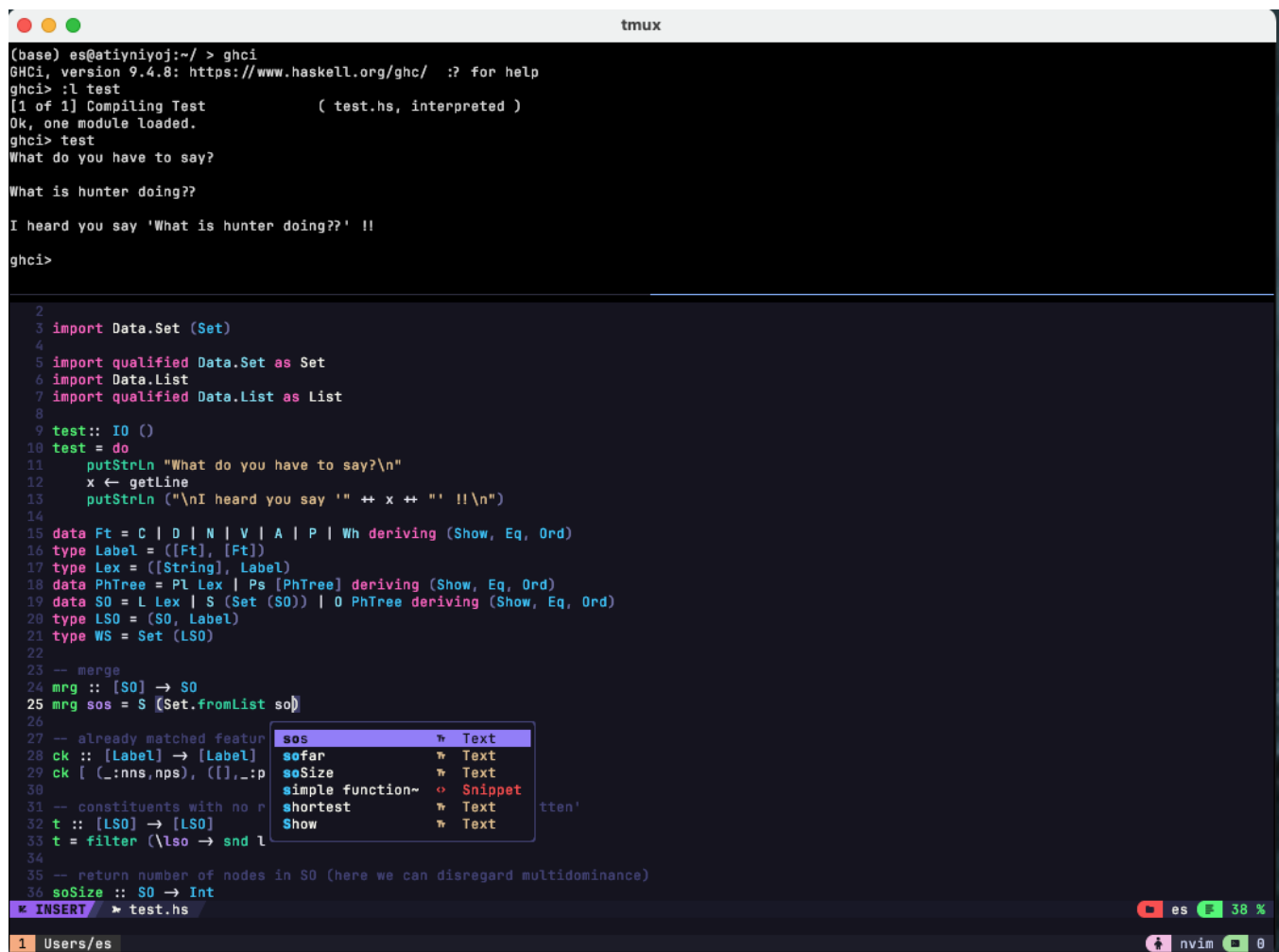
```
brew install ripgrep
ghcup install hls
stack install haskell-dap ghci-dap haskell-debug-adapter
```

- Opening a kitty terminal, in settings, I add

```
font_family      JetBrainsMono Nerd Font Mono
bold_font        JetBrainsMono Nerd Font Mono ExtraBold
bold_italic_font JetBrainsMono Nerd Font Mono ExtraBold Italic
```

Then, closing and reopening, in a kitty terminal, I set up the NvChad configuration following the suggestions used on the webpage mentioned above, here, and then tell nvim to do syntax highlighting, add lines to `init.lua`, create `haskell.lua` as described for Ubuntu, above.

Then start tmux in terminal; split screen into 2 panes; start nvim in one of them; write, edit, save code in nvim; run code in the other pane as it is developed. An alternative that avoids learning how tmux works is just to use nvim (with the NvChad configuration), opening a terminal inside nvim with `⌘h`.



The screenshot shows a tmux window with two panes. The top pane is a terminal running GHCi, and the bottom pane is an nvim editor showing a Haskell file named `test.hs`.

Terminal Pane (GHCi):

```
(base) es@atiynioj:~/ > ghci
GHCi, version 9.4.8: https://www.haskell.org/ghc/  :? for help
ghci> :l test
[1 of 1] Compiling Test          ( test.hs, interpreted )
Ok, one module loaded.
ghci> test
What do you have to say?

What is hunter doing??

I heard you say 'What is hunter doing??' !!

ghci>
```

nvim Editor Pane (test.hs):

```
2
3 import Data.Set (Set)
4
5 import qualified Data.Set as Set
6 import Data.List
7 import qualified Data.List as List
8
9 test:: IO ()
10 test = do
11   putStrLn "What do you have to say?\n"
12   x <- getLine
13   putStrLn ("I heard you say '" ++ x ++ "' !!\n")
14
15 data Ft = C | D | N | V | A | P | Wh deriving (Show, Eq, Ord)
16 type Label = ([Ft], [Ft])
17 type Lex = ([String], Label)
18 data PhTree = Pl Lex | Ps [PhTree] deriving (Show, Eq, Ord)
19 data S0 = L Lex | S (Set (S0)) | O PhTree deriving (Show, Eq, Ord)
20 type LS0 = (S0, Label)
21 type WS = Set (LS0)
22
23 -- merge
24 mrg :: [S0] -> S0
25 mrg sos = S (Set.fromList so)
26
27 -- already matched feature
28 ck :: [Label] -> [Label]
29 ck [ (_:nns,nps), ([],_:p
30
31 -- constituents with no r
32 t :: [LS0] -> [LS0]
33 t = filter (\lso -> snd l
34
35 -- return number of nodes in S0 (here we can disregard multidominance)
36 soSize :: S0 -> Int
```

The nvim editor shows a code snippet for `soSize` with a tooltip:

soSize	Text
soFar	Text
soSize	Text
simple function~	Snippet
shortest	Text
Show	Text

The bottom status bar of the nvim editor shows the file path `1 Users/es` and the current mode `INSERT`.



```
<ctrl>-b default <prefix>
<ctrl>-_ my <prefix>
```

sessions

```
tmux new -s mysession1 new mysession1
tmux a mysession1 attach mysession1
tmux ls list sessions
<ctrl>-_ $ rename session
<ctrl>-_ d detach from session
```

windows

```
<ctrl>-_ c create new window
<ctrl>-_ p previous window
<ctrl>-_ n next window
<ctrl>-_ 1...9 window by number
<ctrl>-_ & close current window
```

panes

```
<ctrl>-_ " split horizontal
<ctrl>-_ % split vertical
<ctrl>-_ z toggle zoom
<ctrl>-_ ←↑↓→ switch pane (or mouse)
<ctrl>-_ h j k l switch pane (or mouse)
<ctrl>-_ ! convert pane to window
<ctrl>-_ x close current pane
```



motion

```
0 zero moves cursor to beginning of line
$ move cursor to end of line
M move cursor to middle line on screen
gg move to first line
G move to last line
#G goto line #
#H goto #th line in window
```

general

```
:u undo last command
:undo undo last command
:redo redo last command
. repeat last command (in normal mode)
:sp split window (close w :q)
:vsp split window vertically
:only make current window the only one
:new file split and open file
```

save, write, quit

```
:q :q! quit, quit quick
:w file write to file
:wq save and quit
<ctrl>-s save
```

search

```
/pattern search forward to pattern
?pattern search backward to pattern
```

cut and paste

```
yy yank 1 line
Y yank 1 line
Y$ yank to end of line
#Y yank # of lines
p put before cursor
P put after cursor
```

edit

```
x delete symbol under cursor
X delete backwards from cursor
R replace to end of line
D delete to end of line
dd delete current line
i a insert before, after cursor
I A insert at beginning, end of line
esc escape insert mode
J join next line w no space
gJ join next line w space
:s/old/new/ replace next old w new
:s/old/new/g replace old w new in line
:%s/old/new/g replace old w new in file
:%s/old/new/gc replace with confirmations
~ change case of char under cursor
vEU/u uppercase/lowercase word
vU/u uppercase/lowercase word
```

insert

```
:r file insert file here
```



```
_ my <prefix>
```

motion

```
<ctrl>-_ move cursor to next word
<ctrl>-e move screen forward 1 line
<ctrl>-y move screen forward 1 line
<ctrl>-d move forward 1/2 screen
<ctrl>-u move backward 1/2 screen
<ctrl>-f move forward 1/2 screen
<ctrl>-b move backward 1/2 screen
```

nvimtree

```
<ctrl>-n toggle nvimtree
<return> in tree, open window on file under cursor
a in tree, add new file in current dir
```

telescope

```
_th select themes
_fh find help
_fb show buffers
```

general

```
_ch toggle cheat sheet
_n toggle line numbers
_x close current buffer
_h split and open terminal
```

haskell

```
:MasonInstallAll manage lsp's etc
:checkhealth lsp check lsp
:LspInfo check lsp
_rr split and open ghci session
_rq quit ghci session
_ea evaluate code snippets
_hs hooogle search sig under cursor
_cl code lens refresh
```