```
RRRRRRRRRRRRRRRRR       iiii                                                          iiii
R::::::::::::::::R      i::::i                                                        i::::i
R::::::RRRRRR:::::R      iiii                                                          iiii
RR:::::R     R:::::R
  R::::R     R:::::Riiiiiiipppppp   ppppppppp      aaaaaaaaaaaaa  rrrrr   rrrrrrrrr  iiiiiii  aaaaaaaaaaaaa  nnnn  nnnnnnnn
  R::::R     R:::::Ri:::::ip:::::ppp:::::::p      a:::::::::::::a r::::rrr:::::::::r i:::::i  a:::::::::::::a n:::nn::::::::nn
  R::::RRRRRR:::::R  i::::iip:::::::::::::::p     aaaaaaaaa:::::ar:::::::::::::::::r  i::::i  aaaaaaaaa:::::an::::::::::::::nn
  R:::::::::::::RR   i::::iipp::::::ppppp::::p             a::::arr::::::rrrrr::::::ri::::i           a::::an:::::::::::::::n
  R::::RRRRRR:::::R  i::::i p:::::p     p:::::p     aaaaaaa:::::a r:::::r     r:::::ri::::i    aaaaaaa:::::a n:::::nnnn:::::n
  R::::R     R:::::R i::::i p:::::p     p:::::p   aa::::::::::::a r:::::r     rrrrrrri::::i  aa::::::::::::a n::::n    n::::n
  R::::R     R:::::R i::::i p:::::p     p:::::p  a::::aaaa::::::a r:::::r            i::::i a::::aaaa::::::a n::::n    n::::n
  R::::R     R:::::R i::::i p:::::p    p::::::p a::::a    a:::::a r:::::r            i::::ia::::a    a:::::a n::::n    n::::n
RR:::::R     R:::::Ri::::::ip:::::ppppp:::::::pa::::a    a:::::a r:::::r           i::::::ia::::a    a:::::a n::::n    n::::n
R::::::R     R:::::Ri::::::ip::::::::::::::::p a:::::aaaa::::::a r:::::r           i::::::ia:::::aaaa::::::a n::::n    n::::n
R::::::R     R:::::Ri::::::ip::::::::::::::pp   a::::::::::aa:::ar:::::r           i::::::i a::::::::::aa::a n::::n    n::::n
RRRRRRRR     RRRRRRRiiiiiiiip::::::pppppppp      aaaaaaaaaa  aaaa rrrrr           iiiiiiii  aaaaaaaaaa  aaaa nnnnnn    nnnnnn
                           p::::::p
                           p::::::p
                           p::::::p
                           p::::::p
                           p::::::p
                           pppppppppp
```

GeoScripting
~TeamTropical

Introduction

Tropical river areas

Benefits:

- Water quality
- River bank stability
- Wildlife habitat
- Erosion
- Flood control

© WildMadagascar.org

Goal

Objective:

"To protect fragile riparian buffer zones by providing up-to-date geographical information to both foresters and rangers"

Easy access to information

- Foresters
- Rangers

Study Area:

Peru

Forester J. Sohn

- Load and pre-process Landsat 7
- Calculate NDVI, generate map and threshold graph
- Extract water pixels and filter
- Create a buffer and visualize
- See if his trees are inside the buffer

Buffer - 600 meters

Ranger B. Vast

Time Series - Download ESPA; 2004 to 2015,
Cloud cover < 40 %, Landsat 7 = 31 images; VI, FMASK, Fill

- Untar and automatically process a batch of Landsat 7 image series - processLandsatBatch
- Mask the NDVI layers to the riparian buffer zone
- Apply Bfast for deforestation monitoring and output results

Custom functions

CleanAnd Drop

Inside Outside

River Extract

ViCalc

Adaptable Landsat 7 masking tool

Clouds, cloud shadow, fill

Fully scalable input interactive map

Text file with coordinates

User based pixel extraction

Pixel value & Area threshold

Vi Calculator

NDVI / NDMI

Adataple Landsat 7 masking function

CleanAnd
Drop

```
# Clean and Drop function for Landsat 7 data
#
# This function masks cloud in combination with the cloud shadow and has an optio to fill the missing data from
# the broken scanline corrector on Landsat 7. After masking this function drops the mask layers
#
# Necessary inputs:
# - dataset: A rasterstack containing all the Landsat 7 files called
# - x: Cloud mask layer (not Nullable)
# - y: Fill mask layer (optional)
#
# Returns:
#  - StudyAreaClean: a RasterBrick containing the masked bands


CleanAndDrop <- function(dataset, x, y) {
  if(missing(y)) {
    clouds <- dataset[[x]]
    cloudshadows <- dataset[[10]]
      CloudMask <- merge(clouds, cloudshadows)
        StudyAreaClean <- dropLayer(dataset, c(1, 2, 9:14))
        StudyAreaClean[CloudMask == 255] <- NA
          return (StudyAreaClean)
  } else {
    fill <- dataset[[y]]
      CloudMask <- merge(dataset[[9]], dataset[[10]], fill)
        StudyAreaClean <- dropLayer(dataset, c(1, 2, 9:14))
        StudyAreaClean[CloudMask == 255] <- NA
          return (StudyAreaClean)
  }
}
```
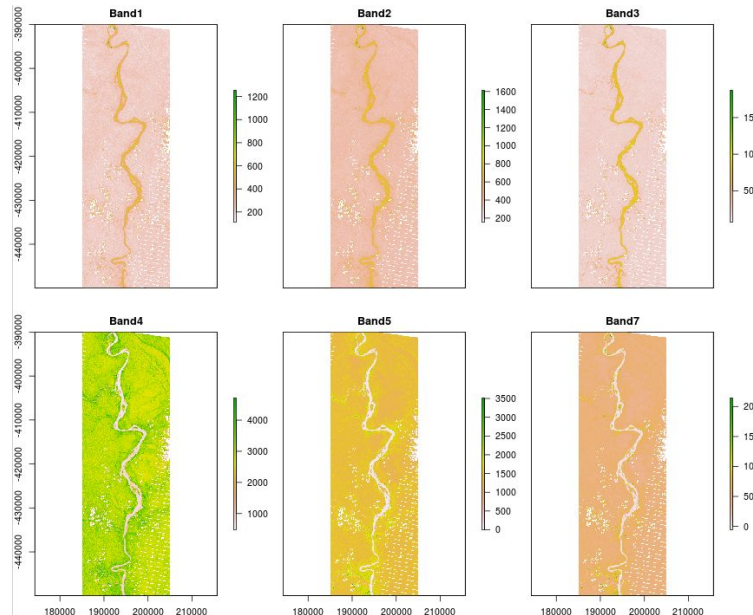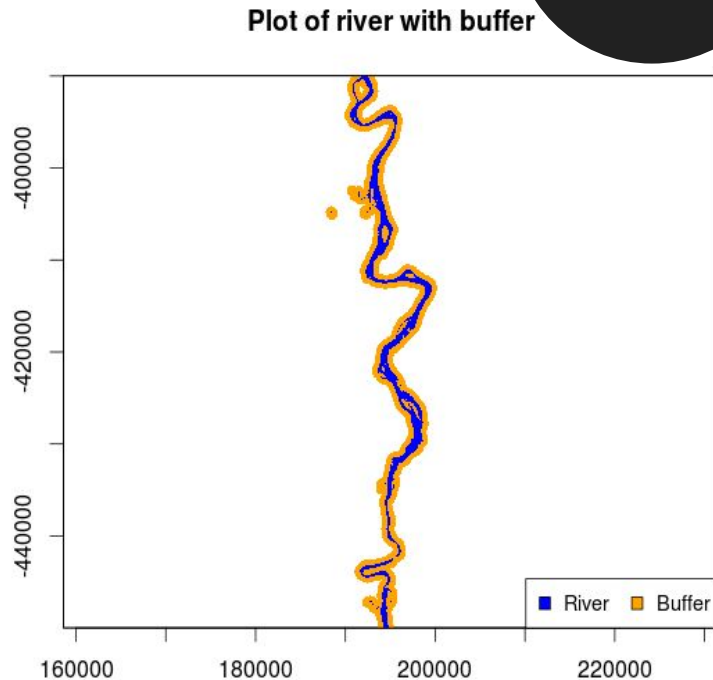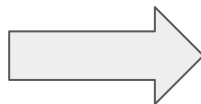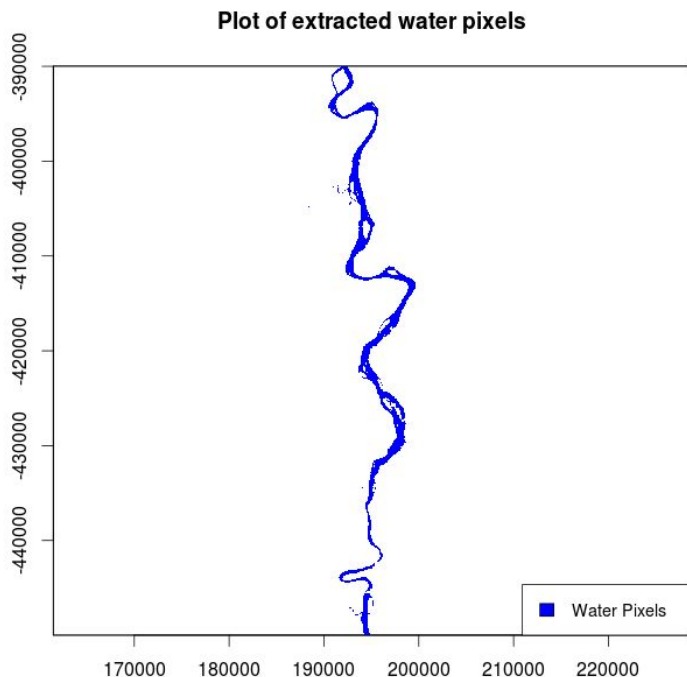
Calculate NDVI using ViCalc, output map and threshold graph

ViCalc
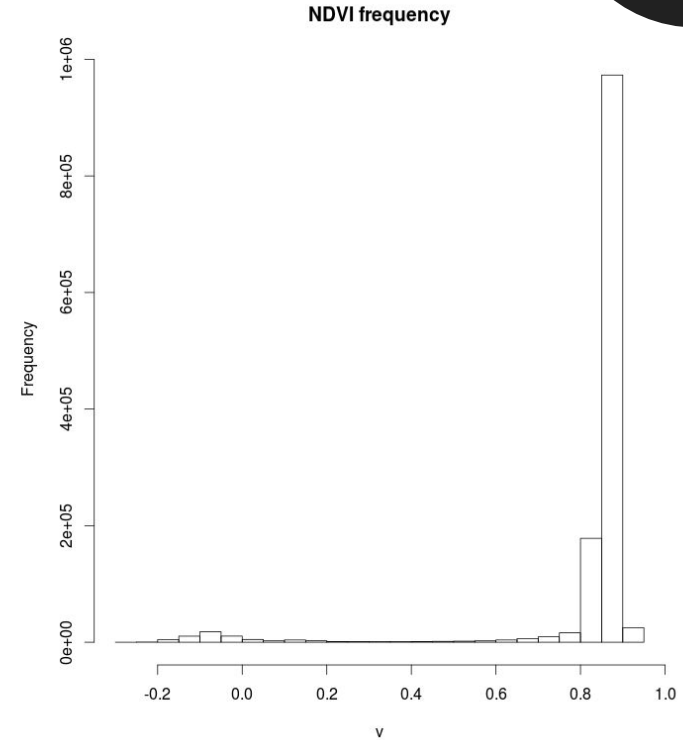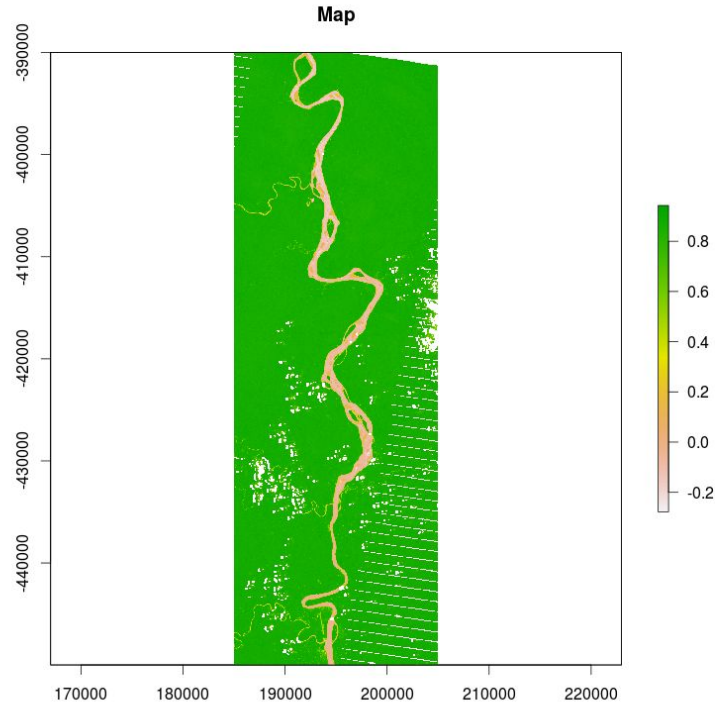
Extract water pixels and filter on area size using custom function and create variable buffer

River Extract

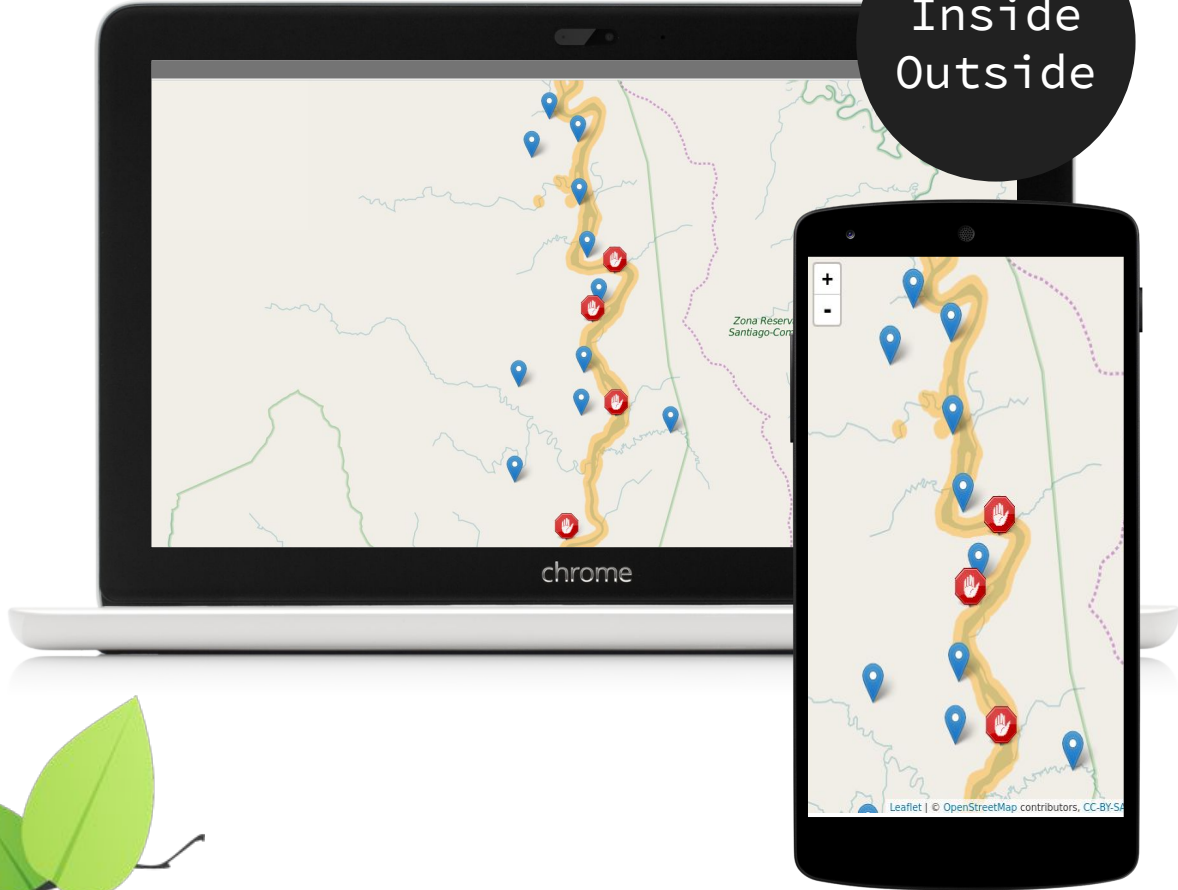
Plot of extracted water pixels

Plot of river with buffer

Automatic water pixel detection

Adataple buffer size

Read user's list of
coordinates and determine
if locations are inside
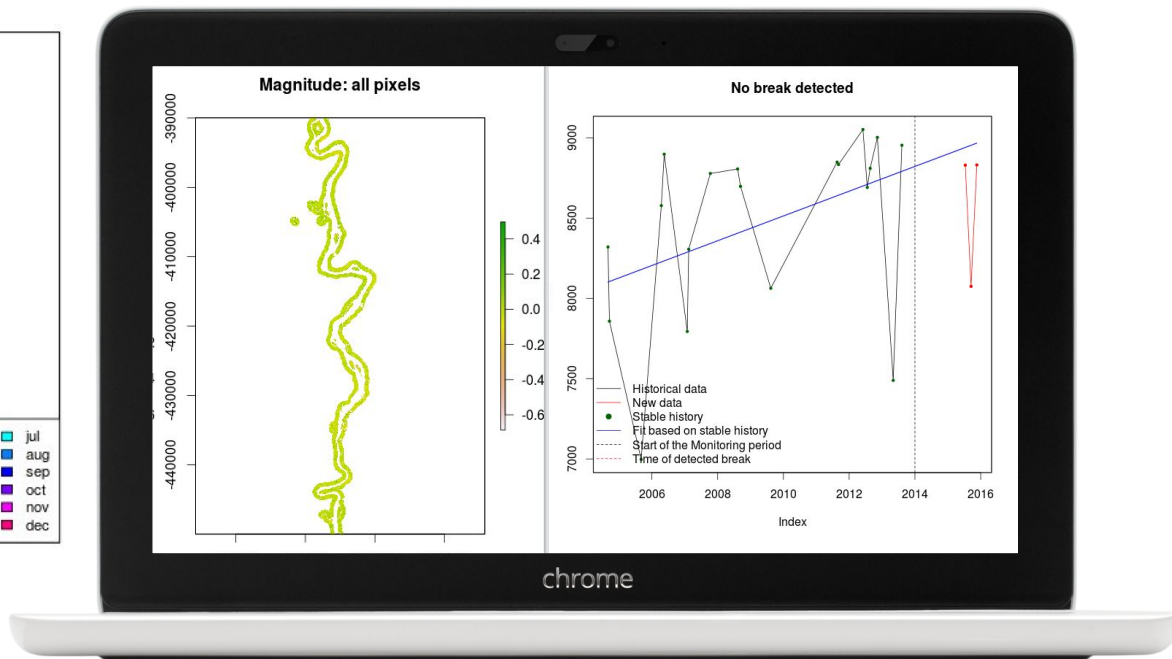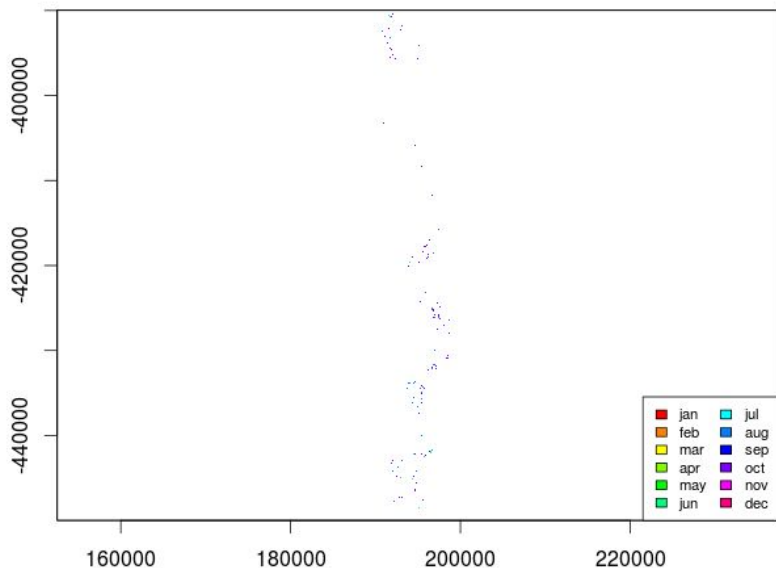riparian buffer zones.

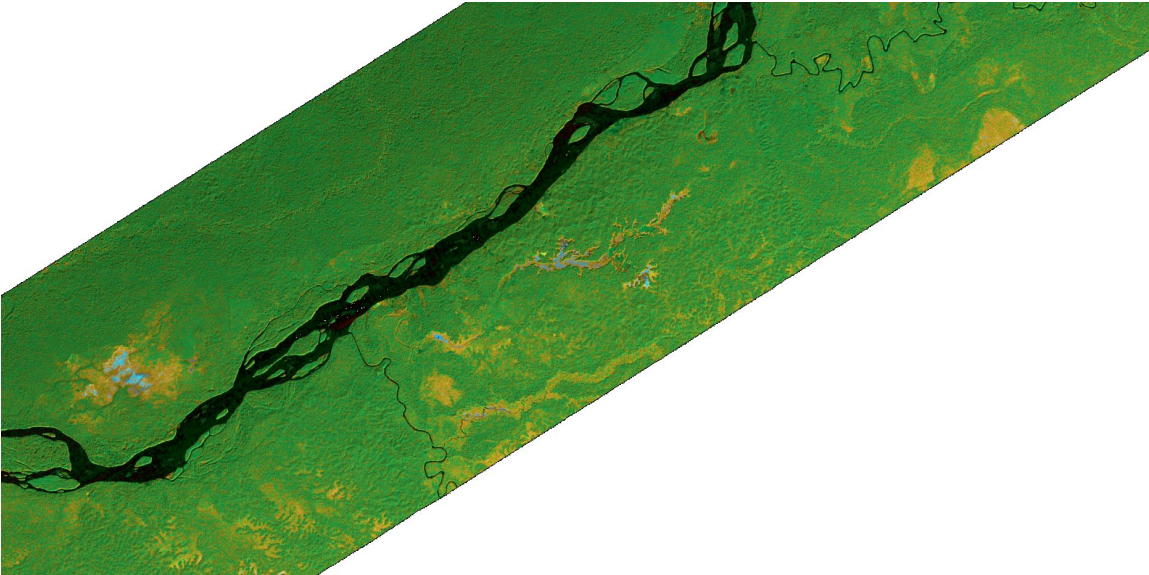Return an interactive map
showing the results

Inside
Outside

Deforestation monitoring in riparian buffer zones

Bfast Spatial

```
RRRRRRRRRRRRRRRRR        iiii                                                                           iiii
R::::::::::::::::R      i::::i                                                                         i::::i
R::::::RRRRRR:::::R      iiii                                                                           iiii
RR:::::R     R::::R
  R::::R     R::::Riiiiiiippppp   ppppppppp     aaaaaaaaaaaaa  rrrrr   rrrrrrrrr   iiiiiii  aaaaaaaaaaaaa  nnnn  nnnnnnnn
  R::::R     R::::Ri:::::ip:::ppp:::::::::p     a::::::::::::a r::::rrr:::::::::r  i:::::i   a::::::::::::a n:::nn::::::::nn
  R::::RRRRRR:::::R i::::ip:::::::::::::::::p    aaaaaaaaa:::::ar::::::::::::::::r   i::::i   aaaaaaaaa:::::an::::::::::::::nn
  R:::::::::::::RR  i::::ipp::::::ppppp::::::p            a::::arr::::::rrrrr::::::ri::::i            a::::an:::::::::::::::::n
  R::::RRRRRR:::::R i::::i p:::::p     p:::::p     aaaaaaa:::::a r:::::r     r:::::ri::::i    aaaaaaa:::::a  n:::::nnnn:::::n
  R::::R     R::::R i::::i p:::::p     p:::::p   aa::::::::::::a r:::::r     rrrrrrri::::i  aa::::::::::::a  n::::n    n::::n
  R::::R     R::::R i::::i p:::::p     p:::::p  a::::aaaa::::::a r:::::r            i::::i a::::aaaa::::::a  n::::n    n::::n
  R::::R     R::::R i::::i p:::::p    p::::::pa::::a    a:::::a r:::::r            i::::ia::::a    a:::::a  n::::n    n::::n
RR:::::R     R::::Ri::::::ip:::::ppppp::::::pa::::a    a:::::a r:::::r           i::::::ia::::a    a:::::a  n::::n    n::::n
R::::::R     R::::Ri::::::ip::::::::::::::::p a:::::aaaa::::::a r:::::r           i::::::ia:::::aaaa::::::a  n::::n    n::::n
R::::::R     R::::Ri::::::ip::::::::::::::pp   a::::::::::aa:::ar:::::r           i::::::i a::::::::::aa:::a n::::n    n::::n
RRRRRRRR     RRRRRRRiiiiiiiip::::::pppppppp     aaaaaaaaaa  aaaarrrrrrr           iiiiiiii  aaaaaaaaaa  aaaa nnnnnn    nnnnnn
                          p:::::p
                          p:::::p
                         p:::::::p
                         p:::::::p
                         p:::::::p
                         ppppppppp
```

Questions?