

nonlinear-time.r

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2022-10-24

#<https://www.vanderbilt.edu/AnS/psychology/cogsci/chaos/workshop/NDS.html>

```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.1.2
```

```
## -- Attaching packages ----- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.6      v purrr 0.3.4
```

```
## v tibble 3.1.2      v dplyr 1.0.7
```

```
## v tidyr 1.1.3      v stringr 1.4.0
```

```
## v readr 1.4.0      v forcats 0.5.1
```

```
## Warning: package 'ggplot2' was built under R version 4.1.3
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

```
## x dplyr::filter() masks stats::filter()
```

```
## x dplyr::lag() masks stats::lag()
```

```
library(ggplot2)
```

```
nlinear <- function(x0,r,t=30){
```

```
  x=numeric()
```

```
  x
```

```
  for (i in 1:t) {
```

```
    if (i==1){
```

```
      x[i]=x0
```

```
    }else{
```

```
      x[i]=r*x[i-1]*(1-x[i-1])
```

```
    }
```

```
  }
```

```
  df=data.frame(t=1:t,x=x)
```

```
  df$x1=lag(x)
```

```
  return(df)
```

```
}
```

```
test=nlinear(0.5,0.8)
```

```
df
```

```
## function (x, df1, df2, ncp, log = FALSE)
## {
##     if (missing(ncp))
##         .Call(C_df, x, df1, df2, log)
##     else .Call(C_dnf, x, df1, df2, ncp, log)
## }
## <bytecode: 0x0000000012c90778>
## <environment: namespace:stats>
```

```
library(ggpubr)
```

```
## Warning: package 'ggpubr' was built under R version 4.1.3
```

```
test=nlinear(0.5,3.54)
```

```
p1=ggplot(test)+
  geom_line(aes(x=t,y=x))
```

```
p2=ggplot(test)+
  geom_point(aes(x=x1,y=x))
```

```
ggarrange(p1,p2)
```

```
## Warning: Removed 1 rows containing missing values (geom_point).
```

