

# Statistical learning on Mice moverment

## Contents

<b>1</b>	<b>ML project introduction</b>	<b>1</b>
1.1	Outline of the proccess . . . . .	1
1.2	Importing data . . . . .	1
1.3	all.mice . . . . .	2
1.4	all.mice with theta . . . . .	2
1.5	vel.all.mice (summary of each run) . . . . .	2
1.6	all.vel.mice (vel in certain interval) . . . . .	2
<b>2</b>	<b>Plotting</b>	<b>4</b>
2.1	all.mice . . . . .	4
2.2	theta.C against theta.T . . . . .	6
2.3	Vel.all.mice (each run) . . . . .	8
2.4	all.mice.summary . . . . .	14

## 1 ML project introduction

This project is on animal behavior analysis. The data was retrieved form Catwalk videos which is coordinates of head, centre and tail of a mouse while on gait analysis. An weight-independent variable,  $\theta$ , was firt introduced into gait analysis. This proof-of-concept project is going to apply relevent variables into machine learning algorithm. The aims are for classification of treatment groups.

### 1.1 Outline of the proccess

1. Importing data
  - all.mice
  -
2. Calculate the rotating angle,  $\theta$ 
  - Ploting the data
3. Models bulding
  - Supervised models
    - Linear regression
      - \* Validate coefficients (t-test)
      - \* Validate the model ( $R^2$ , correlation, F-test)
    - Multiple regression
    - k-nesrest neighbor
    - Desicion tree

### 1.2 Importing data

- The data with coordinates were imported into R.
  - all.mice (function : read.excel.sheet() )

- The calculation of the  $\theta$ 
  - all.mice with theta.T, theta.C (function : angle.calculation.tail() )
- The average velocity, theta and variety of theta
  - vel.all.micev: mean velocity and mad.Y in head, centre and tail. mean and var of theta.C and theta.T.
- The interval velocity
  - all.vel.summary: vel, mad.Y, in.t (in head, centre and tail)

### 1.3 all.mice

ID	Group	Run	ID.RUN	Point	t	X	Y
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.00	-120.7007	-6.832117
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.01	-116.6882	-7.039849
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.02	-113.3913	-6.885866
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.03	-110.7075	-6.962225
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.04	-107.7575	-6.682212
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.05	-104.3316	-6.733936

### 1.4 all.mice with theta

ID	Group	Run	ID.RUN	Point	t	X	Y	Tail.theta	Centre.theta
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.00	-120.7007	-6.832117	-9.280046	-11.45875
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.01	-116.6882	-7.039849	-9.519585	-11.03176
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.02	-113.3913	-6.885866	-9.975006	-10.40310
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.03	-110.7075	-6.962225	-10.173734	-11.37096
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.04	-107.7575	-6.682212	-10.020763	-12.04048
WTUT292.2e	WTUT	RUN1	WTUT292.2eRUN1	Head	0.05	-104.3316	-6.733936	-9.964424	-11.78205

### 1.5 vel.all.mice (summary of each run)

ID	Run	Group	Point	mean.velocity	madY	mean.angle.C	mean.angle.T	var.angle.C	var.angle.T
NPCTG277.4c	RUN11	NPCTG	Head	111.1091	6.177003	0.3329221	0.3735576	0.0062284	0.0062284
NPCTG277.4c	RUN4	NPCTG	Head	133.9463	7.584904	0.4172837	0.3634669	0.0183310	0.0183310
NPCTG277.4c	RUN5	NPCTG	Head	113.6850	13.019440	0.2539512	0.2232740	0.0035479	0.0035479
NPCTG286.1g	RUN1	NPCTG	Head	147.3275	6.121339	0.2177319	0.1868291	0.0036588	0.0036588
NPCTG286.1g	RUN11	NPCTG	Head	251.6702	6.362217	0.1598703	0.1685110	0.0023466	0.0023466
NPCTG286.1g	RUN12	NPCTG	Head	188.6835	5.183094	0.1378683	0.1178457	0.0010951	0.0010951

### 1.6 all.vel.mice (vel in certain interval)

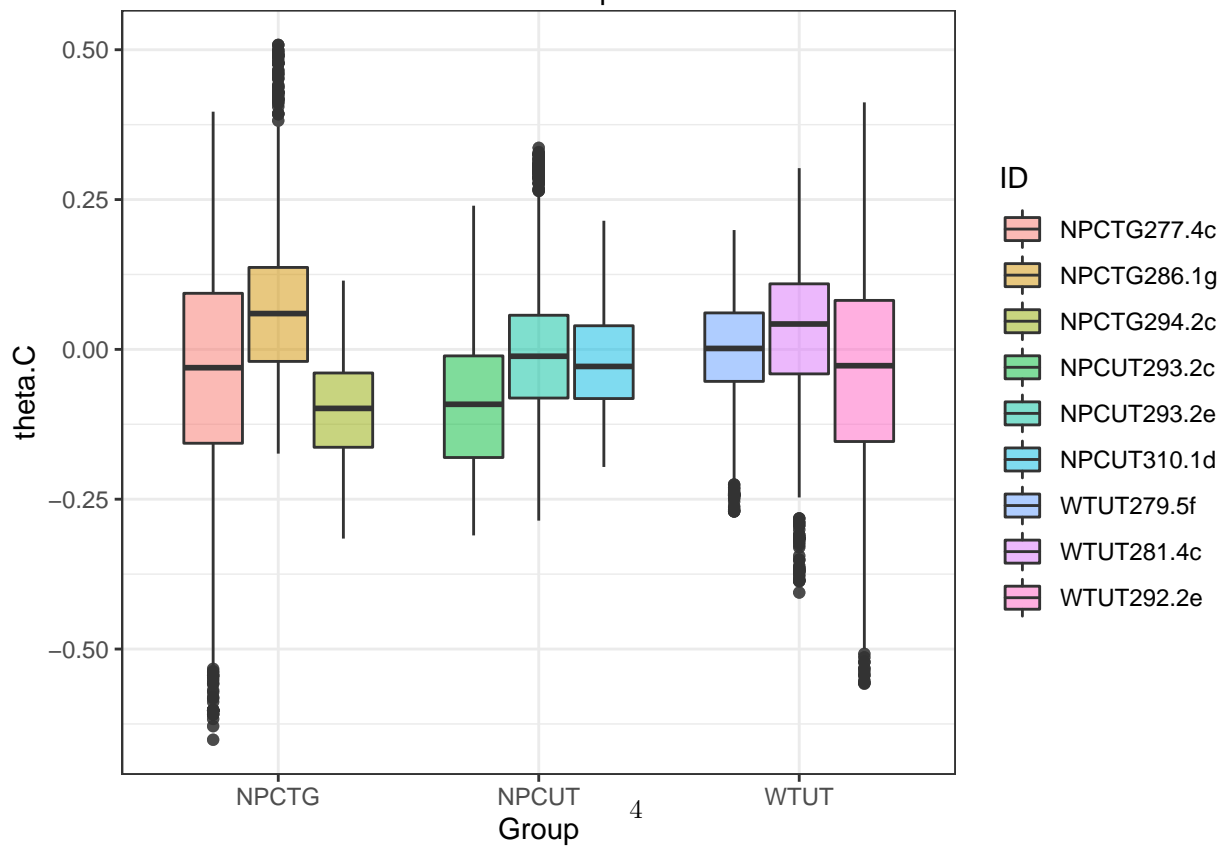
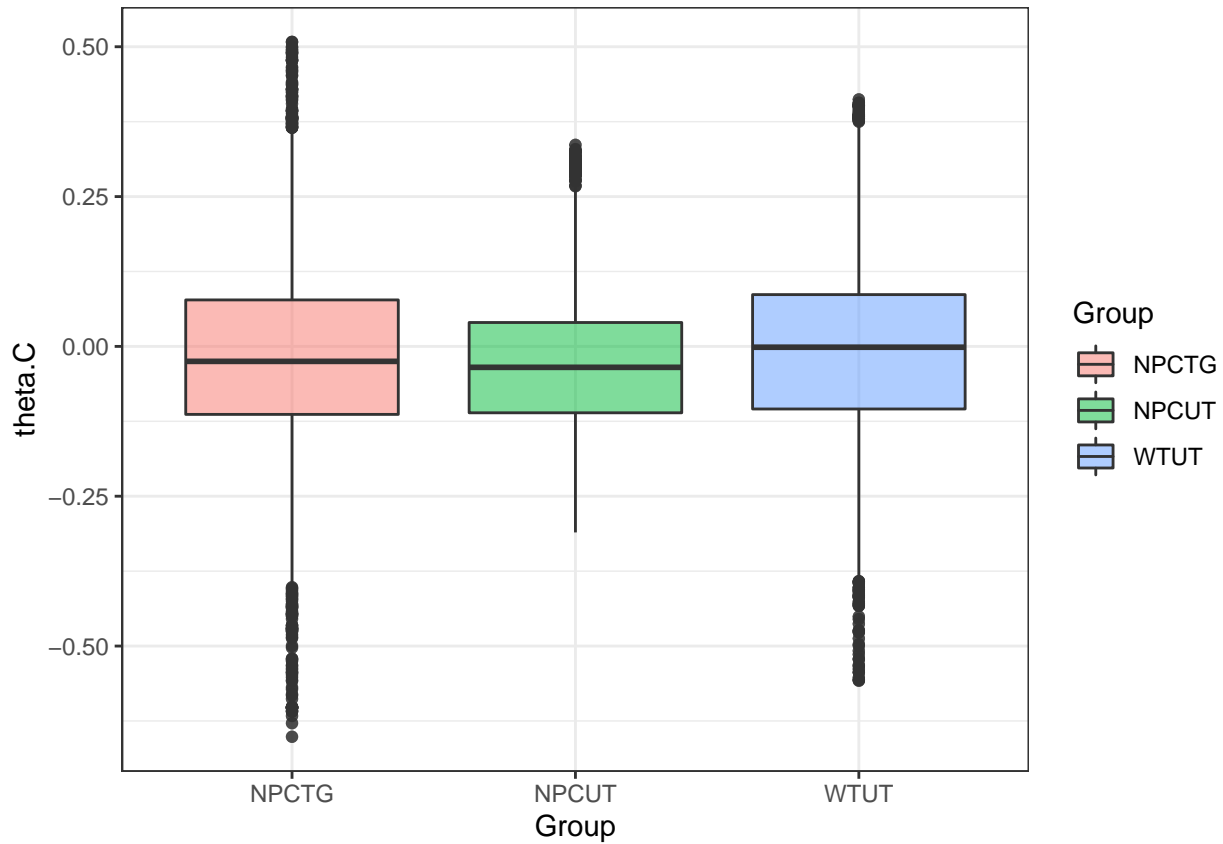
vel	mad.Y	in.t	Point	Group	ID
365.61636	0.0796890	0.02	Head	WTUT	WTUT292.2e
321.40257	0.0766851	0.02	Head	WTUT	WTUT292.2e
71.97784	0.3207077	0.17	Head	WTUT	WTUT292.2e
2514.64246	9.0869424	0.12	Head	WTUT	WTUT292.2e
491.56863	2.7128967	0.04	Head	WTUT	WTUT292.2e
2339.71743	2.7766148	0.03	Head	WTUT	WTUT292.2e



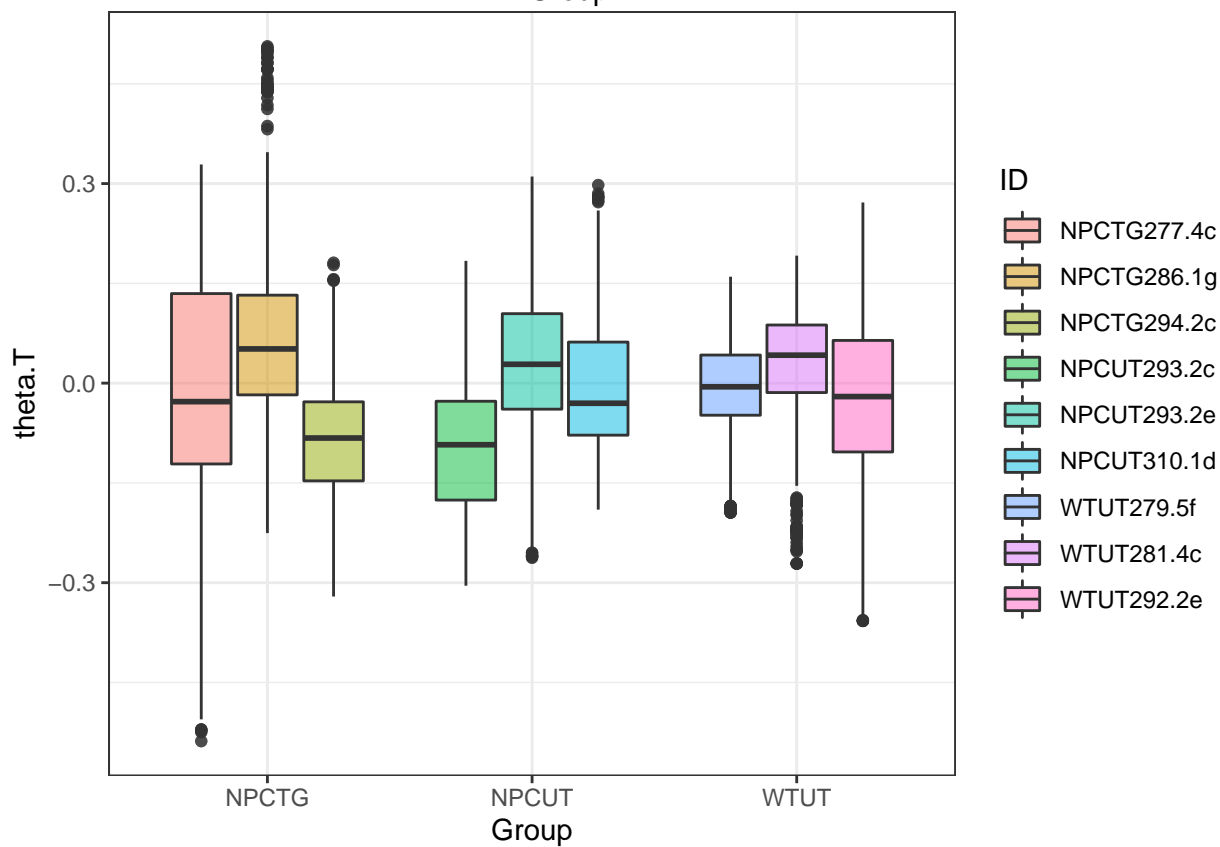
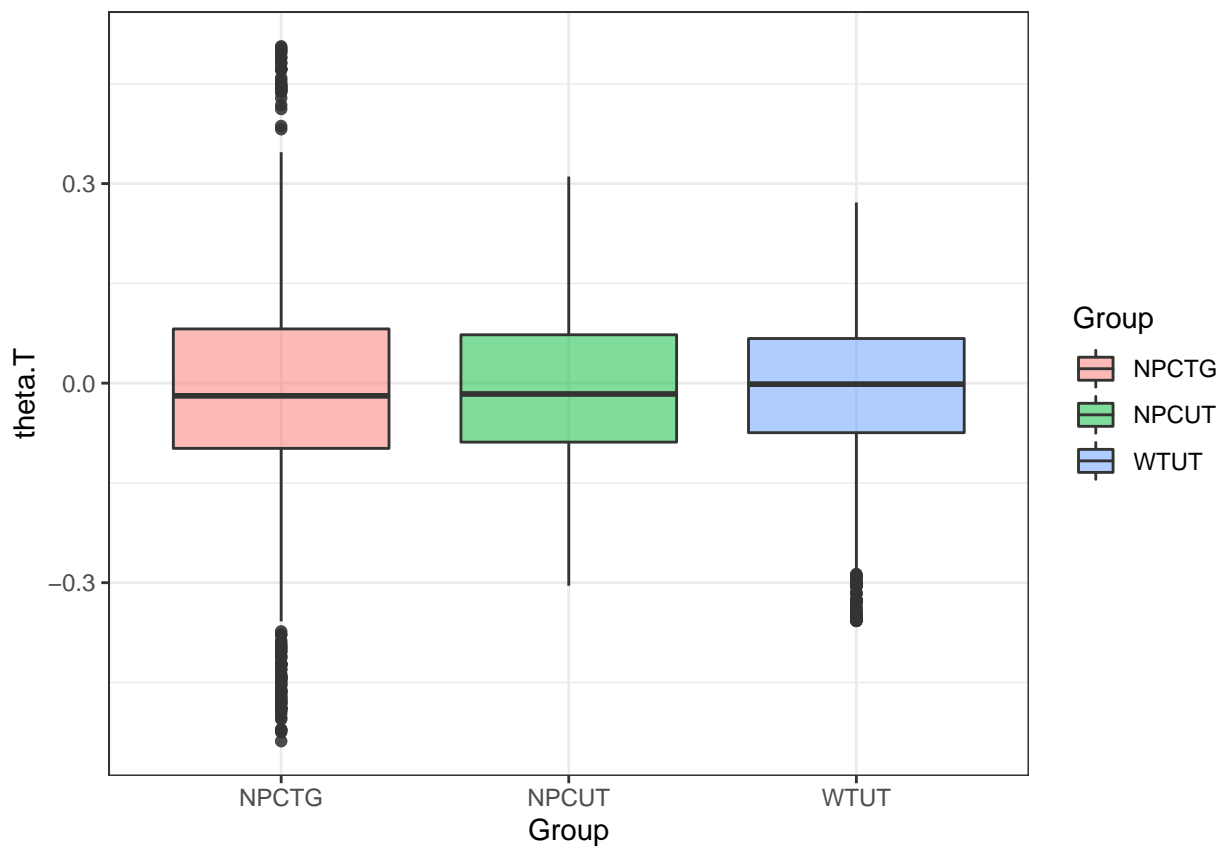
## 2 Plotting

### 2.1 all.mice

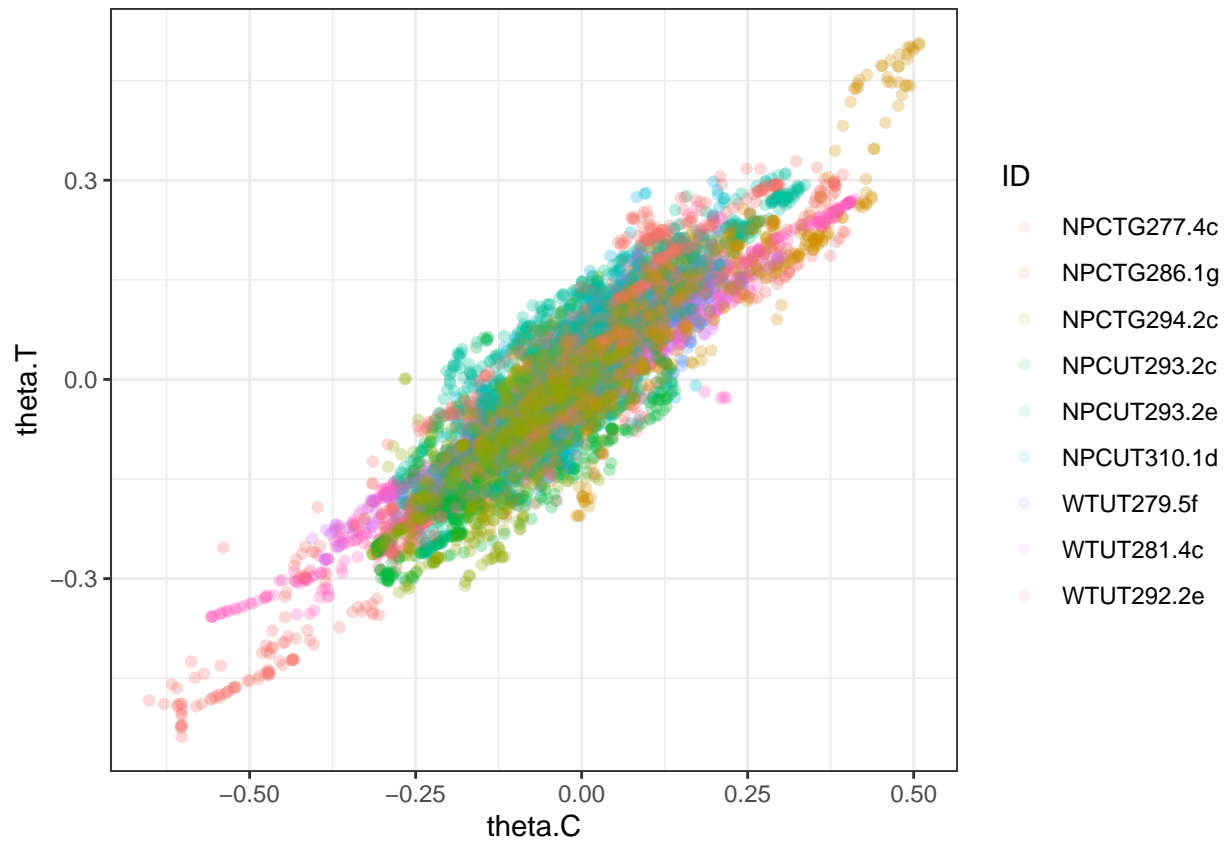
#### 2.1.1 theta.C



### theta.T



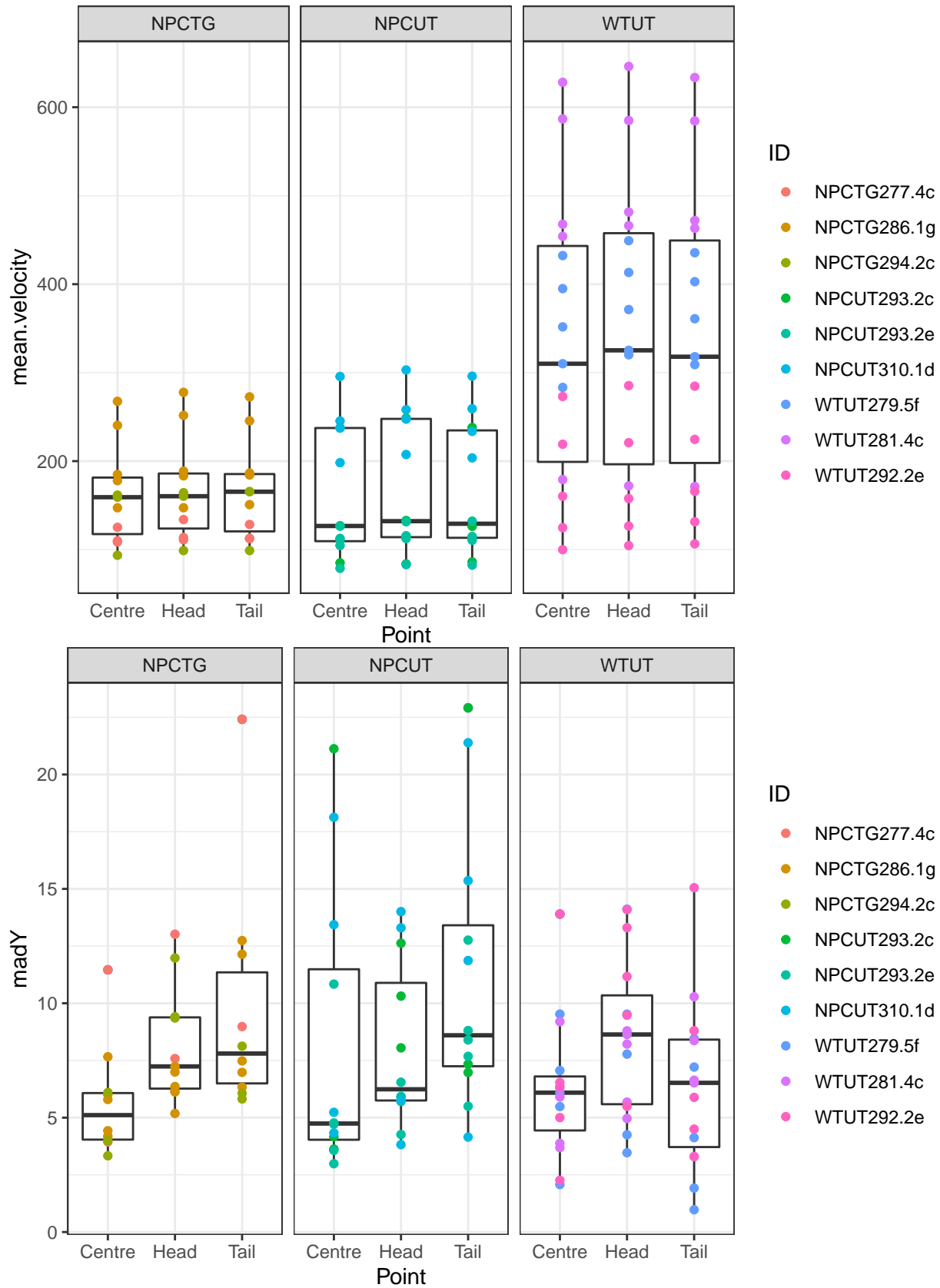
## 2.2 theta.C against theta.T





## 2.3 Vel.all.mice (each run)

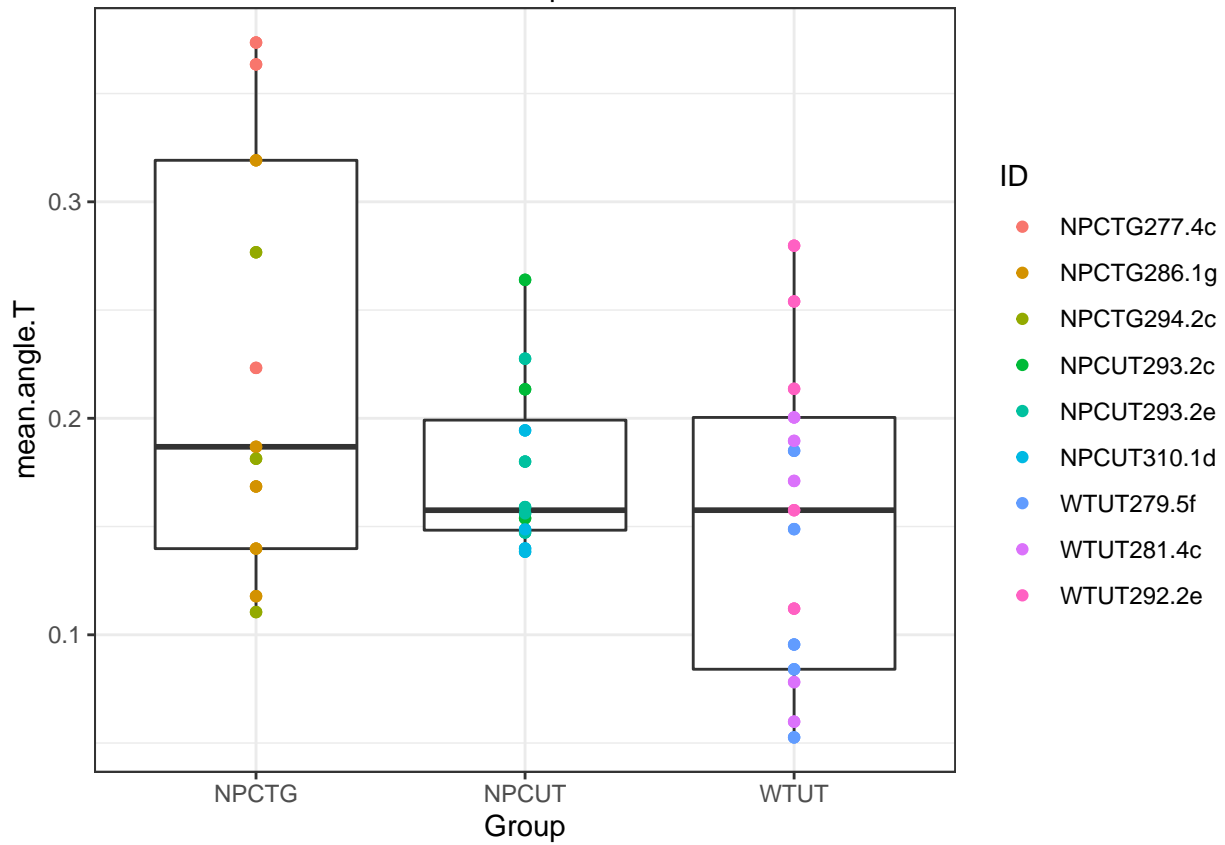
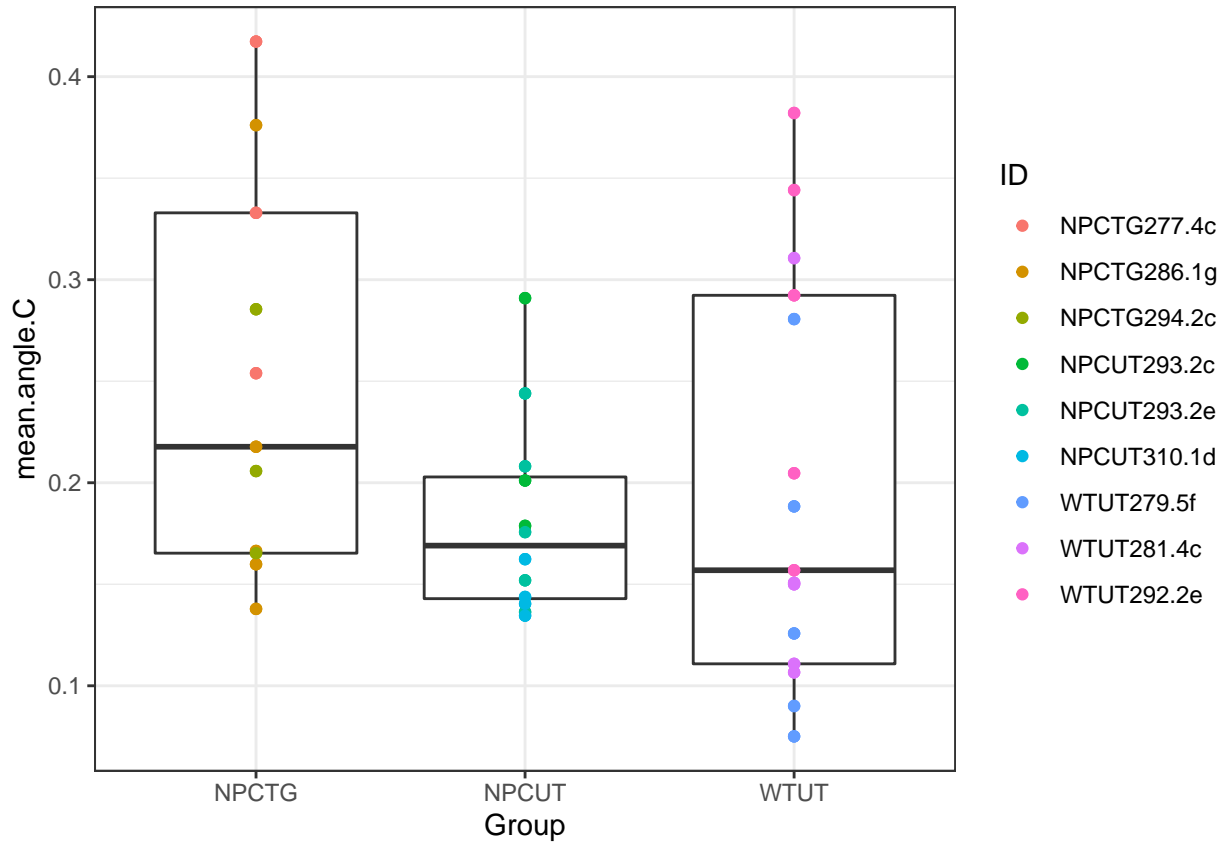
### 2.3.1 mean velocity and madY





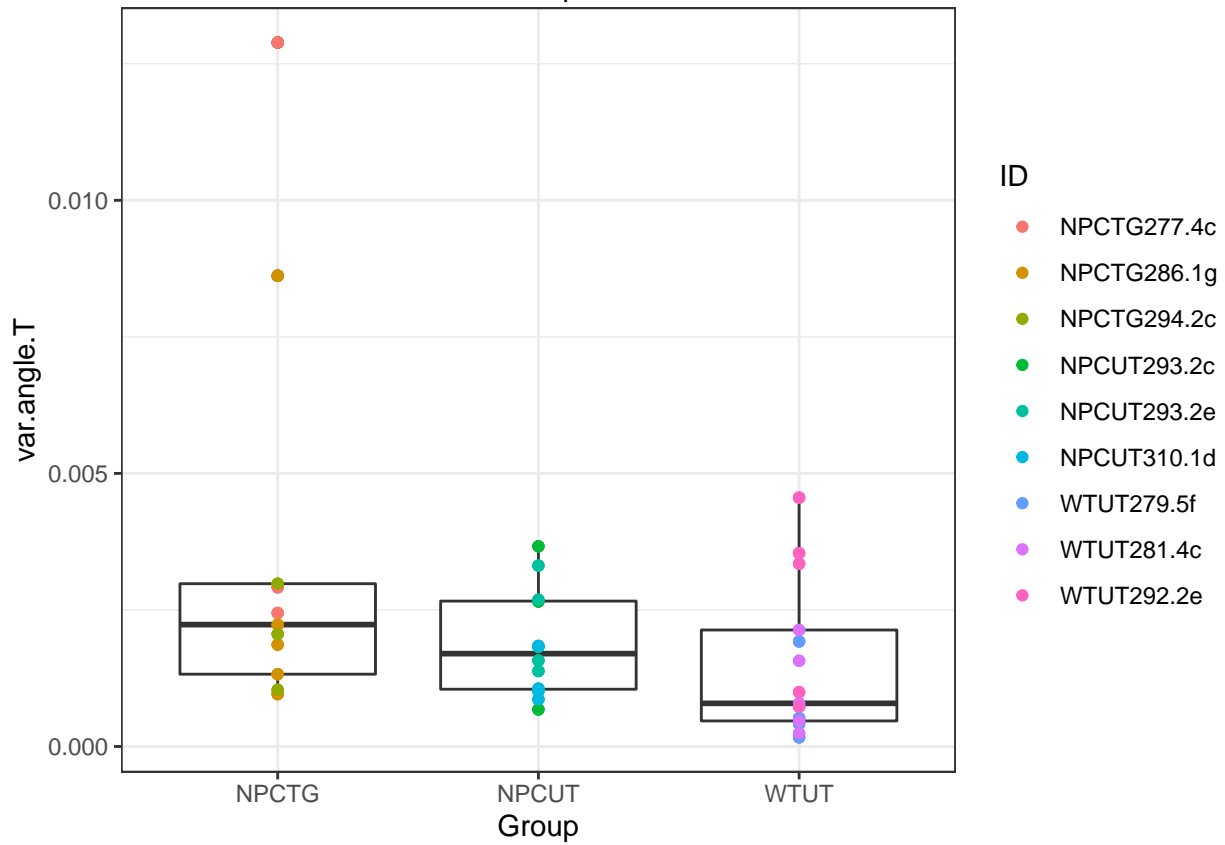
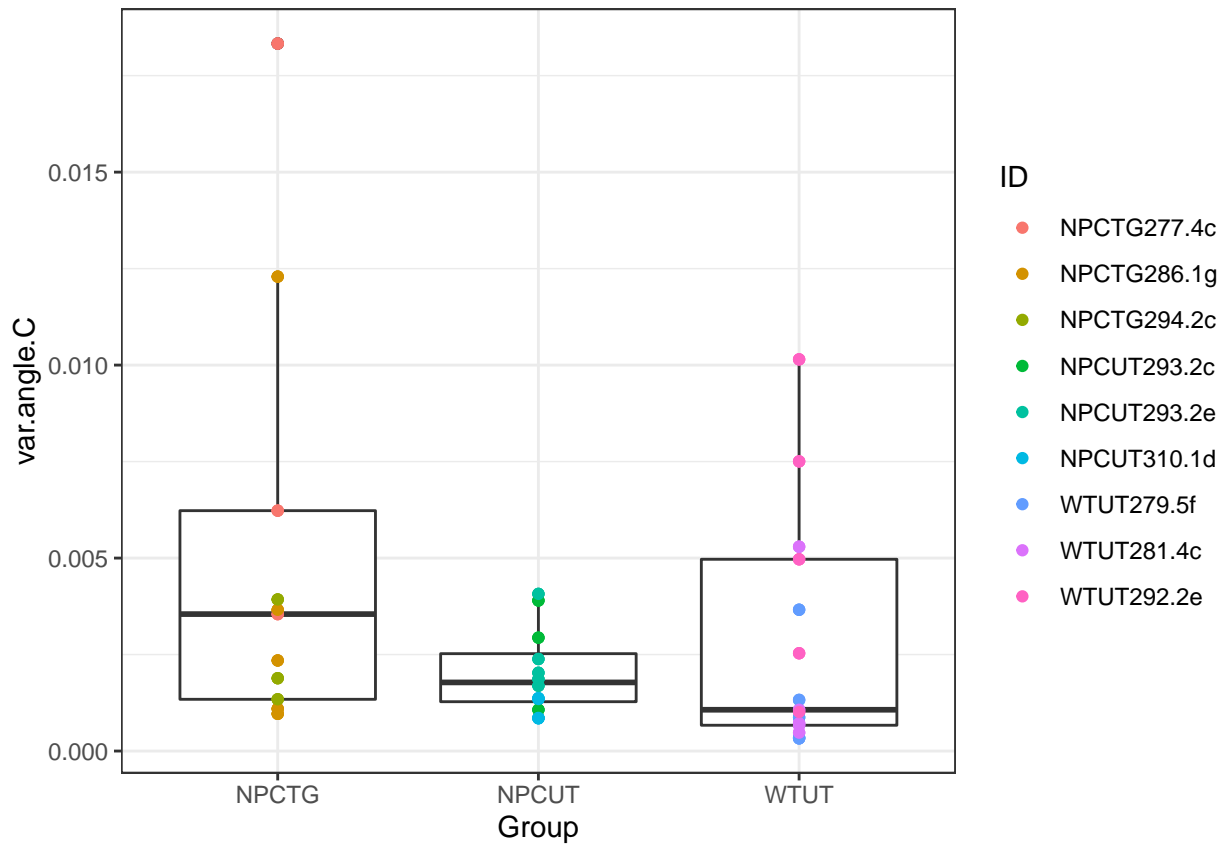


### 2.3.2 mean angle in centre and tail





### 2.3.3 variety angle centre and tail





## 2.4 all.mice.summary

### 2.4.1 velocity, mad.Y and in.t

