System Description
- A Fingerprint Method for Track 8

Team: GoD

Team members:

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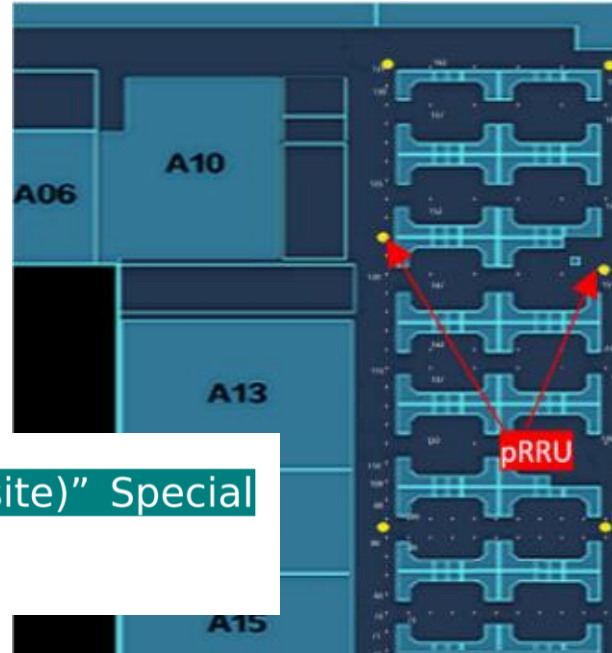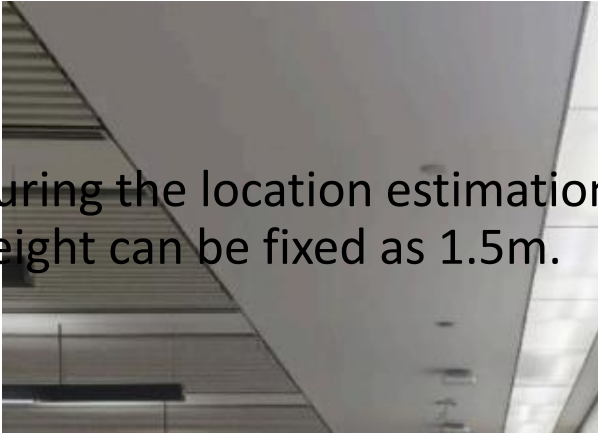25th-28th Sep. 2023, Nuremberg Germany

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Brief description

During the location estimation, UE's height can be fixed as 1.5m.

A10

A06

A13

pRRU

Track 8: "5G in open-plan office (off-site)" Special features

A15

Testing Area: 15 x 40 meters office;

8 pico Remote Radio Units (pRRUs) with known locations;

During the testing, different cases have been considered, including a person holds the phone, the phone is fixed on a stick and the phone is in the pocket. The data is collected modeling the normal situations in the office, such as straight walking, speed up, slow down, stops and turns.

-- Official Document

Introduction of Track 8

Data we can use

	A	B	C	D	E	F	G	H	I	J	K
1	#uwTime	frmNum	subFrmNu	toa1(ns)	toa2(ns)	toa3(ns)	toa4(ns)	toa5(ns)	toa6(ns)	toa7(ns)	toa8(ns)
2	56575.48	548	3	270	350	334	345.5	335	434	393	395
3	56575.68	568	3	286.5	349.5	333.5	345	335	434	394	395
4	56575.88	588	3	274	348	335	347	368	441	395	384.5

D2

D5

D6

D8

L	M	N	O	P	Q	R	S	T	U
rsrp1(dBm	rsrp2(dBm	rsrp3(dBm	rsrp4(dBm	rsrp5(dBm	rsrp6(dBm	rsrp7(dBm	rsrp8(dBm	x(cm)	y(cm)
-88	-88	-79	-88	-104	-111	-98	-99	0	0
-88	-88	-79	-88	-104	-111	-98	-99	0	0
-88	-88	-79	-89	-104	-111	-98	-99	0	0

Unknown position

0	0
366	3225
0	0

Known position
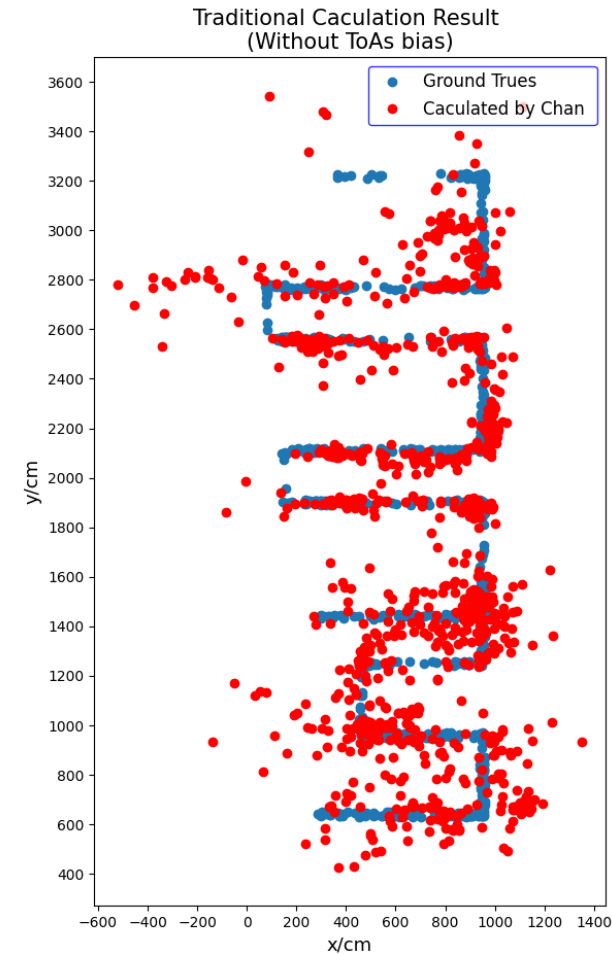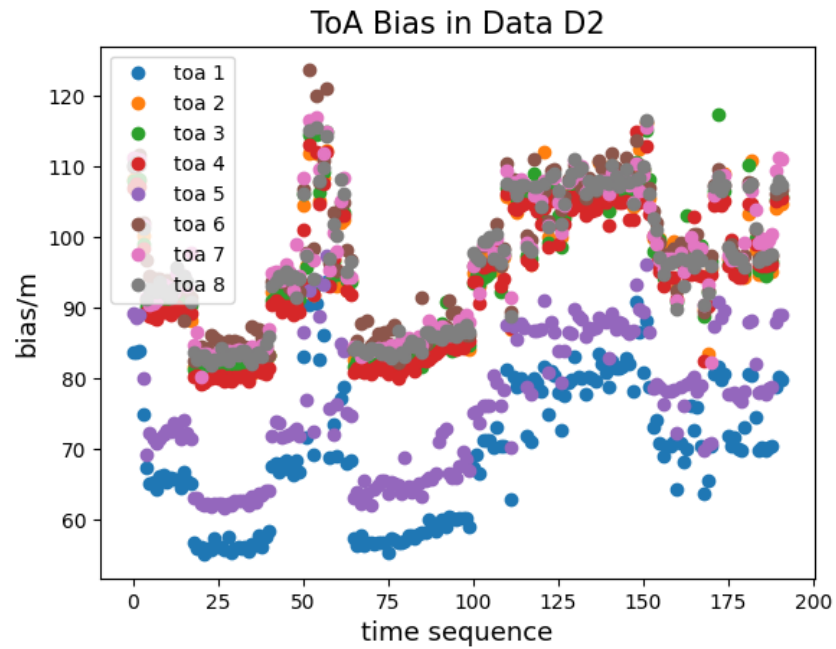
into four groups, i.e., Test A, Test B, Score A and Score B. Each group contains two sets of measurements and each set contains about 3000 measurements (about 10 minutes long) with 200-300 ground-truth positions. Ground-truth positions are only given for the testing sets. The ToA is
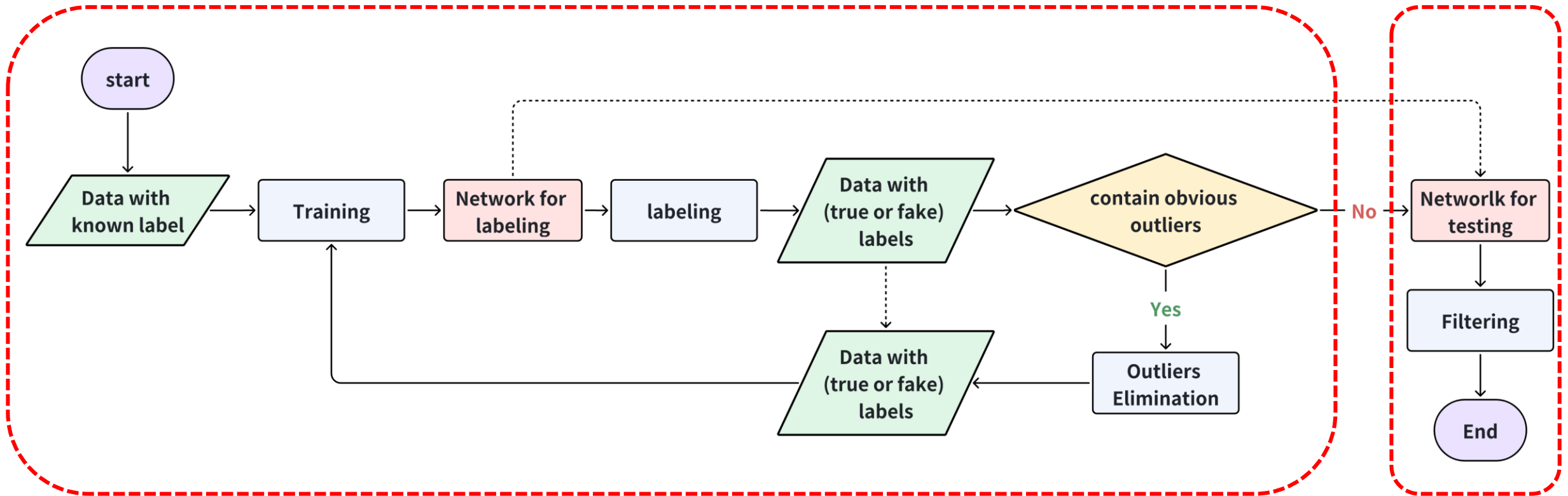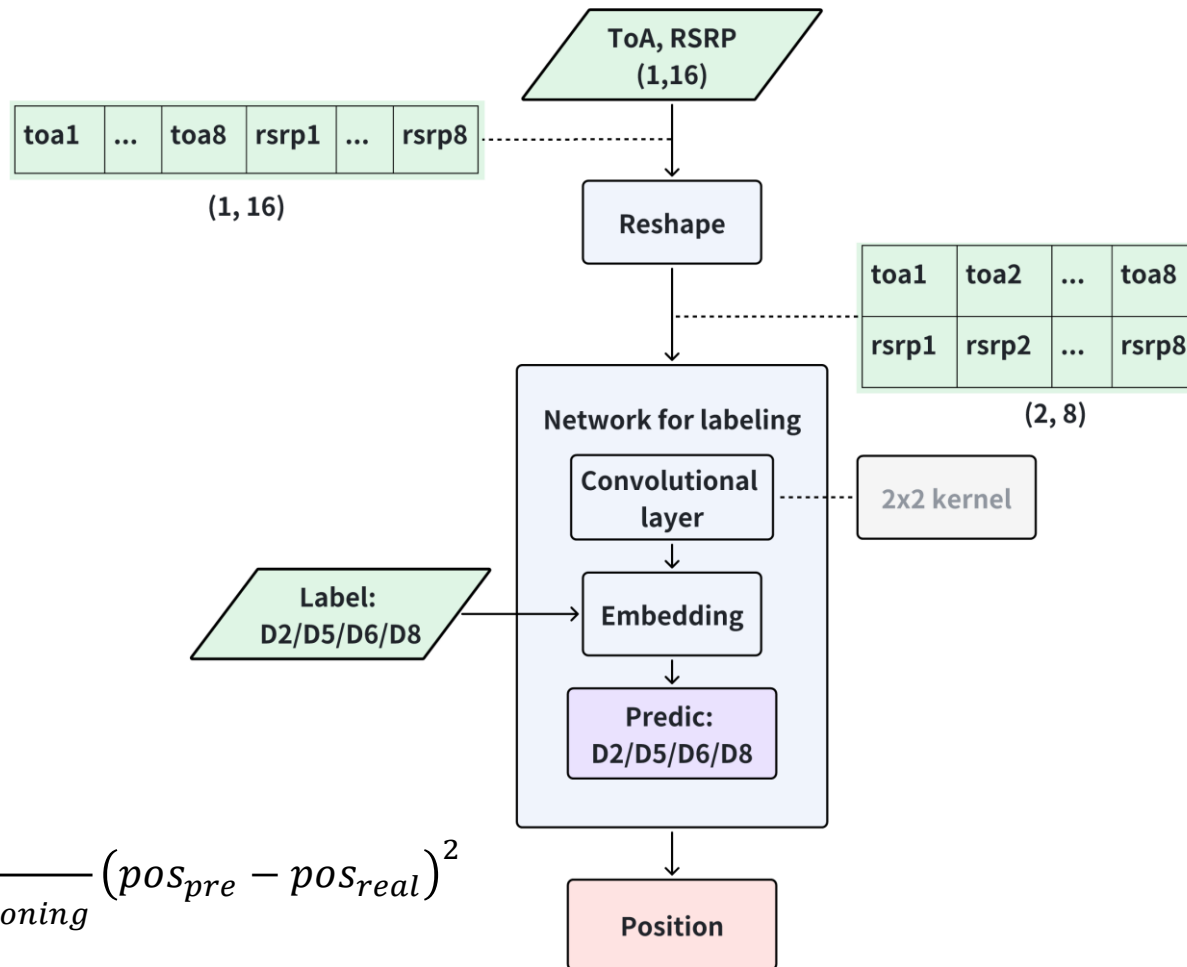
Analysis
Performance of Chan Algorithm

ToA Bias in Data D2

ToA →(correction)→ TDoA → Chan

Traditional Caculation Result
(Without ToAs bias)

Not Accurate Enough！

Proposed Method
Overall scheme

Proposed Method
Network for labeling

$$Loss = \frac{1}{score_{positioning}}(pos_{pre} - pos_{real})^2$$

ToA, RSRP
(1,16)

toa1	...	toa8	rsrp1	...	rsrp8

(1, 16)

Reshape

toa1	toa2	...	toa8
rsrp1	rsrp2	...	rsrp8

(2, 8)

Network for labeling

Convolutional layer — 2x2 kernel

Label:
D2/D5/D6/D8

Embedding

Predic:
D2/D5/D6/D8

Position

Embedding effect
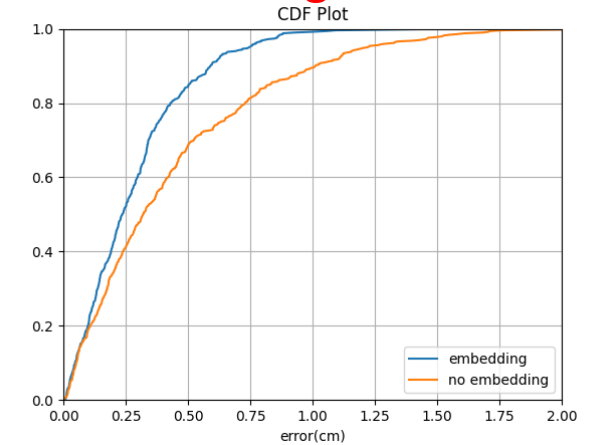
Localization result
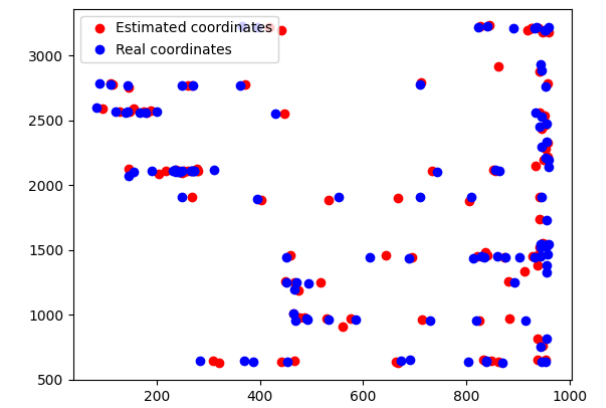
Proposed Method
Final testing process and result
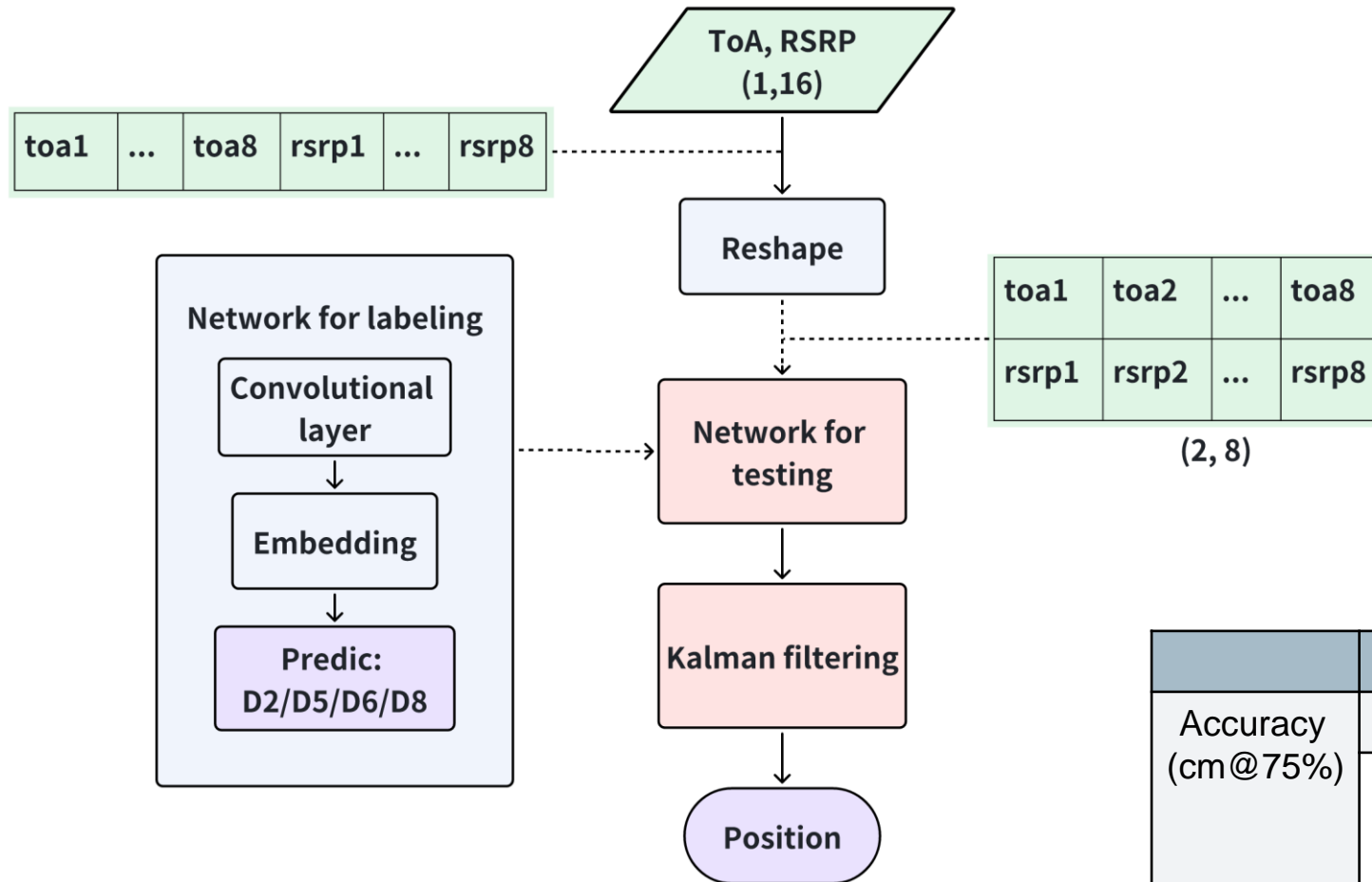
	D1	D2	D4	D7
Accuracy (cm@75%)	150.63cm	98.61cm	113.01cm	144.67cm
	Average score: 124.62cm		Average score: 128.85cm	

Summary

- We proposed a convolutional neural network with an embedding layer for labeling unknown positions.

- We proposed a fingerprint-based system to estimate positions of UEs.

- The results are shown in the table:

Accuracy (cm@75%)	D1	D3	D4	D7	Final results (Best result in two scoring data set)
Team Name: GoD	150.63cm	98.61cm	113.01cm	144.68cm	124.62cm
	Average score: 124.62cm		Average score: 128.85cm		

THANK YOU FOR LISTENING

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