Checkpoint 1: Writing functions in Python

- Follow the Jupyter notebook and find the energy and momentum of the moving object and their associated errors. (You will be submitting this in the Post-lab assignment)
- Energy: 1350.0J ± 503.1J
- Momentum: 90.0 Ns ± 21.2 Ns

TA Checkpoint 2: Elastic collisions

Analyse the elastic collisions videos (Video 1, Video 2) and fill out the following chart assuming a mass of 209 g. Use the video that gives you the best fits.

	Cart 1 initial velocity	Cart 2 initial velocity	Cart 1 final velocity	Cart 2 final velocity
Video 1	0.607 m/s ± 0.00862 m/s	0.0158 m/s ± 0.0295 m/s	0.00196 m/s ± 0.00882 m/s	0.624 m/s ± 0.0159 m/s
Video 2	0.626 m/s ± 0.00657 m/s	-0.338 m/s ± 0.00482 m/s	-0.252 m/s ± 0.0313 m/s	0.595 ± 0.00543

TA Checkpoint 2: Elastic collisions

Analyse the elastic collisions videos and fill out the following chart assuming a mass of 209 g. Use the video that gives you the best fits.

	Cart 1 initial momentum	Cart 2 initial momentum	Cart 1 final momentum	Cart 2 final momentum	Momentum loss
Video 1	0.1269 N/s ± 0.0019 N/s	0.0033 N/s ± 0.0062 N/s	0.00041 N/s ± 0.0018 N/s	0.1304 N/s ± 0.0034 N/s	-0.00061 N/s ± 0.0029 N/s
Video 2	0.1308 ± 0.0015	-0.0706 N/s ± 0.0011 N/s	-0.0527 N/s ± 0.0066 N/s	0.1244 N/s ± 0.0013 N/s	-0.0115 N/s ± 0.0053 N/s

TA Checkpoint 2: Elastic collisions

Analyse the elastic collisions videos and fill out the following chart assuming a mass of 209 g. Use the video that gives you the best fits.

	Cart 1 initial kinetic energy	Cart 2 initial kinetic energy	Cart 1 final kinetic energy	Cart 2 final kinetic energy	Energy loss
Video 1	0.0385J ± 0.0000012J	2.609e-5J ± 0J	4.014e-7J± 0J	0.04069J ± 0.000004J	-0.00216J ± 0.000003J
Video 2	0.04095J ± 0J	0.01194J ± 0J	0.00664J ± 0.000003J	0.03699J ± 0J	0.00925J ± 0.000003J

TA Checkpoint 2: Inelastic collisions

Analyse the inelastic collisions videos (Video 1, Video 2) and fill out the following chart assuming a mass of 309 g (note that this is different from the previous videos). Use the video that gives you the best fits.

	Cart 1 initial velocity	Cart 2 initial velocity	Cart 1 final velocity	Cart 2 final velocity
Video 1	1.3725 m/s ± 0.0005 m/s	-0.0026 m/s ± -0.0026 m/s	0.3307 m/s ± 0.1192 m/s	0.3128 m/s ± 0.0648 m/s
Video 2	0.49 m/s ± 0.064 m/s	-0.010 m/s ± 0 m/s	0.081 m/s ± 0.060 m/s	0.071 m/s ± 0.041m/s

TA Checkpoint 2: Inelastic collisions

Analyse the inelastic collisions videos and fill out the following chart assuming a mass of 309 g. Use the video that gives you the best fits.

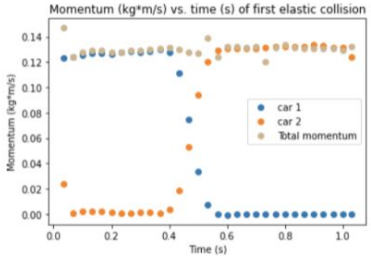
	Cart 1 initial momentum	Cart 2 initial momentum	Cart 1 final momentum	Cart 2 final momentum	Momentum loss
Video 1	0.4241 Ns ± 0.0014 Ns	-0.0008 Ns ± -0.0008 Ns	0.1022 Ns ± 0.0368 Ns	0.0967 Ns ± 0.0200 Ns	0.2245 Ns ± 0.0575 Ns
Video 2	0.15 Ns ± 0.020 Ns	-0.0031 Ns ± 0 Ns	0.025 Ns ± 0.019 Ns	0.022 Ns ± 0.013 Ns	0.10 Ns ± 0.017 Ns

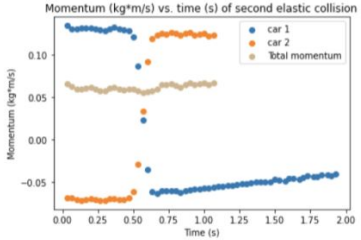
TA Checkpoint 2: Inelastic collisions

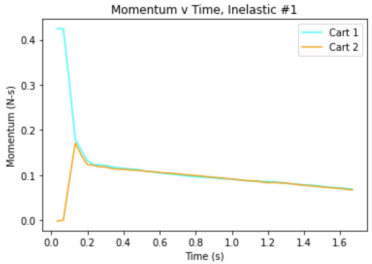
Analyse the inelastic collisions videos and fill out the following chart assuming a mass of 309 g. Use the video that gives you the best fits.

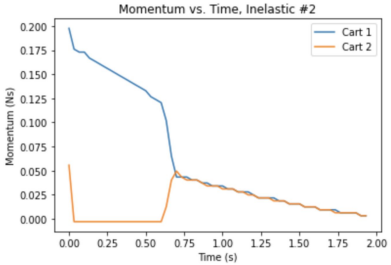
	Cart 1 initial kinetic energy	Cart 2 initial kinetic energy	Cart 1 final kinetic energy	Cart 2 final kinetic energy	Energy loss
Video 1	0.2910J ± 0.0000J	0.0000J ± 0.0000J	0.0169J ± 0.0000J	0.0151J ± 0.0000J	0.2590J ± 0.0001J
Video 2	0.037J ± 0.0099J	3.09×10^{-5}J ± 0J	0.0010J ± 0.0001J	0.00077J ± 0.0000J	0.035J ± 0.0002J

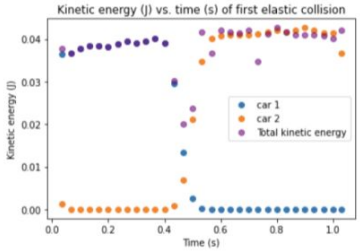
Time Series

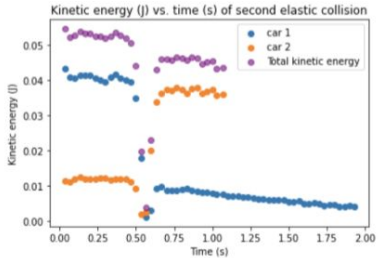

Momentum (kg*m/s) vs. time (s) of first elastic collision
Momentum (kg*m/s)
Time (s)
car 1
car 2
Total momentum

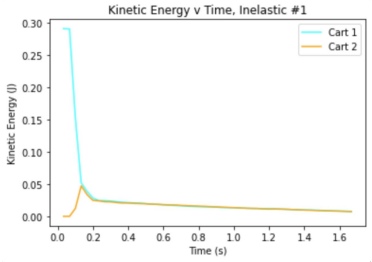

Momentum (kg*m/s) vs. time (s) of second elastic collision
Momentum (kg*m/s)
Time (s)
car 1
car 2
Total momentum

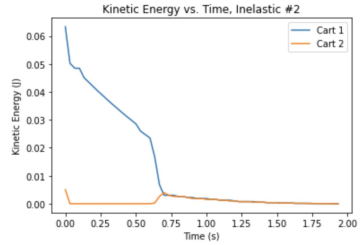

Momentum v Time, Inelastic #1
Momentum (N-s)
Time (s)
Cart 1
Cart 2


Momentum vs. Time, Inelastic #2
Momentum (Ns)
Time (s)
Cart 1
Cart 2


Kinetic energy (J) vs. time (s) of first elastic collision
Kinetic energy (J)
Time (s)
car 1
car 2
Total kinetic energy


Kinetic energy (J) vs. time (s) of second elastic collision
Kinetic energy (J)
Time (s)
car 1
car 2
Total kinetic energy


Kinetic Energy v Time, Inelastic #1
Kinetic Energy (J)
Time (s)
Cart 1
Cart 2


Kinetic Energy vs. Time, Inelastic #2
Kinetic Energy (J)
Time (s)
Cart 1
Cart 2

Difference

- The “elastic” collisions preserve kinetic energy much better than inelastic collisions (although not perfectly)
- The elastic collisions also seemed to preserve the momentum of the system much better than the inelastic ones