AMSI
INDUSTRY DAY
FOR TEACHERS

*Linking classroom maths to **future careers***

AMSI Australian Mathematical Sciences Institute

The Invergowrie Foundation

Swinburne University of Technology

AustralianSuper

Bunnings

CFA

Texas Instruments

AMSI
INDUSTRY DAY FOR TEACHERS

*Linking classroom maths to **future careers***

AMSI
AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

The INVERGOWRIE Foundation

HOUSEKEEPING

- Morning tea at 10.45am
- Lunch at 12.20pm
- Leave for Bunnings HQ at 12:50pm
- Refreshments in the staff room left of the theatre
- Toilets next to the escalators
- Photos– only of those who have consented
- Event will be recorded
- WiFi – Events@Swin Password: swin0325
- Leanne may approach you for a quick chat for the podcast
- Collect *Certificates of Attendance* from
- the registration desk at lunch

Professor Enzo Palombo

Acting Executive Dean, School of Science,
Computing & Emerging Technologies
Swinburne University of Technology

AMSI Australian Mathematical Sciences Institute
The Invergowrie Foundation
Swinburne University of Technology
AustralianSuper
Bunnings
CFA
Texas Instruments

Ms Meghna Aggarwal

Data Analyst, Country Fire Authority

AMSI Australian Mathematical Sciences Institute

The Invergowrie Foundation

Swinburne University of Technology

AustralianSuper

Bunnings

CFA

Texas Instruments

A Career in Data Science

Meghna Aggarwal
Data Analyst, CFA

A bit about me

Data analyst at CFA - analysing data, developing reports & dashboards

I solve problems and answer questions, using data

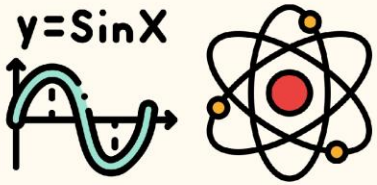
"What are the leading causes of house fires over the last 10 years?"

"How are our brigades performing in terms of meeting service delivery standards?"

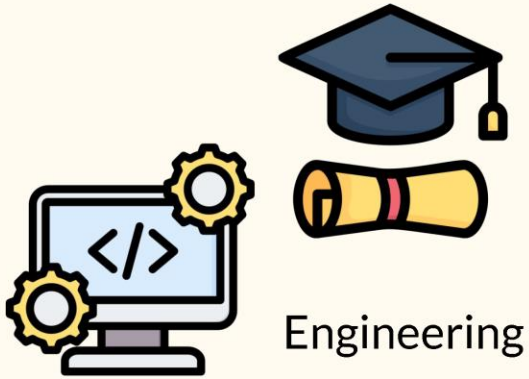
"What types of incidents are we responding to and what are their outcomes?"

"Do our volunteer have the right skills to be deployed for different assignments?"

My career path



> Maths Methods
> Physics, Chemistry
> ICT



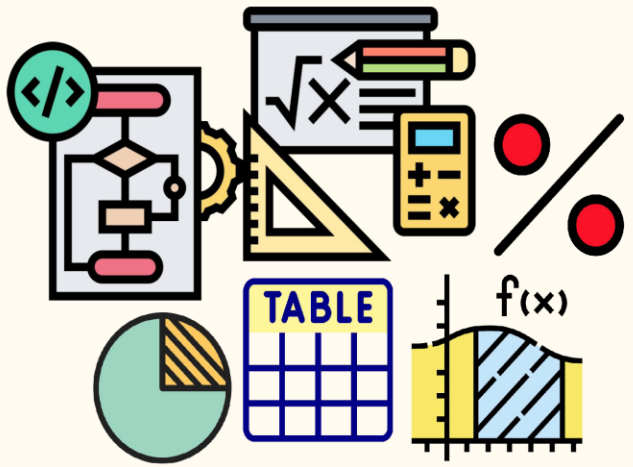
Engineering → Computer Science

> Maths
> Statistics
> Data Structures, Algorithms
> Programming
> Machine Learning

Data Consultant

The possibilities with a data degree

Maths / Data Science Toolkit



Mathematical intuition
Analytical mindset

Finance

Manufacturing

Retail

Gov projects

Health

Education

Scientific Research

and many more!

How I use maths

The maths I use is basic, but everything I do is built on fundamental (& sometimes more complex) mathematical principles.

Statistics - descriptive statistics, a lot of counting

Creating metrics - mathematical understanding to know you're measuring things correctly

Analytical testing - identifying anomalies and outliers

Data transformation/wrangling - based on linear algebra principles

Understanding **relationships** in data or doing **trend analysis**

Optimisation - improving outcomes and business processes

Mr Oliver Clementson

Dealer Capital Markets, Australian Super

AMSI Australian Mathematical Sciences Institute

The Invergowrie Foundation

Swinburne University of Technology

AustralianSuper

Bunnings

CFA

Texas Instruments

AustralianSuper

AMSI Industry Day

Oliver Clementson

AustralianSuper

Introduction

Introduction

Background

- Merbein High School and Mildura Secondary College
- Bachelor of Applied Mathematics from Swinburne University of Technology
- Master of Financial Mathematics from Monash University
- Six years funds management experience across Trading and Risk functions

Teaching Influences

- Year 12 Substitute Maths Teacher
- Year 10 Maths Teacher

Introduction

Bachelor of Applied Science – Mathematics

Broad exposure to a number of different STEM fields:

- Pure Mathematics
- Engineering
- Physics
- Astrophysics
- Quantum Mechanics
- Programming
- Economics

Quant Finance

Master of Financial Mathematics

Focused on finance specific mathematics:
Fair value pricing models
Signal generation
Predicting market moves
General Financial Markets concepts
Industry Internship – first real-world experience

AustralianSuper

Career

Career

Progression

Merbein P-10 COLLEGE

MONASH University

AustralianSuper

SWINBURNE UNIVERSITY OF TECHNOLOGY

VFMC
Victoria's investment specialist

Career

VFMC

Public authority responsible for investing for the benefit of Victorians. Managing funds of more than $93 billion for Victoria and 32 Victorian public authorities and related organisations

My Roles

Risk Function

Using mathematics and data modelling to understand the risks associated with investing in specific private markets

Quant

Programming models to produce long/short signals based on external factors (growth, trend)

AustralianSuper

AustralianSuper

AustralianSuper

Purpose

Our purpose is to help members achieve their best financial position in retirement. We're Australia's largest super fund and manage over $365 billion of retirement savings on behalf of over 3.5 million members

16th largest fund manager globally

Investments Team

Responsible for generating the best risk adjusted returns for members

Asset Class Teams:

- Asset Allocation (My first role at the fund)
- Equities
- Fixed Income
- Private Markets (Infrastructure, Property)
- Liquidity and Implementation

AustralianSuper

Dealing

AustralianSuper

Dealing

One of three Dealers out of Melbourne in a global team responsible for all on market execution of all trades across FX, Fixed Income and Derivatives

Types of flow:

- Asset Allocation
- Active Positions
- Rebalance

Key Requirements:

- Ability to make quick decisions under pressure in a fast-paced environment
- Strong mathematical foundation to calculate the risk/reward of each split-second decision
- Multi-tasking
- Strong knowledge of different markets and economies, keeping up with current news and affairs
- Relationship skills

Dealing

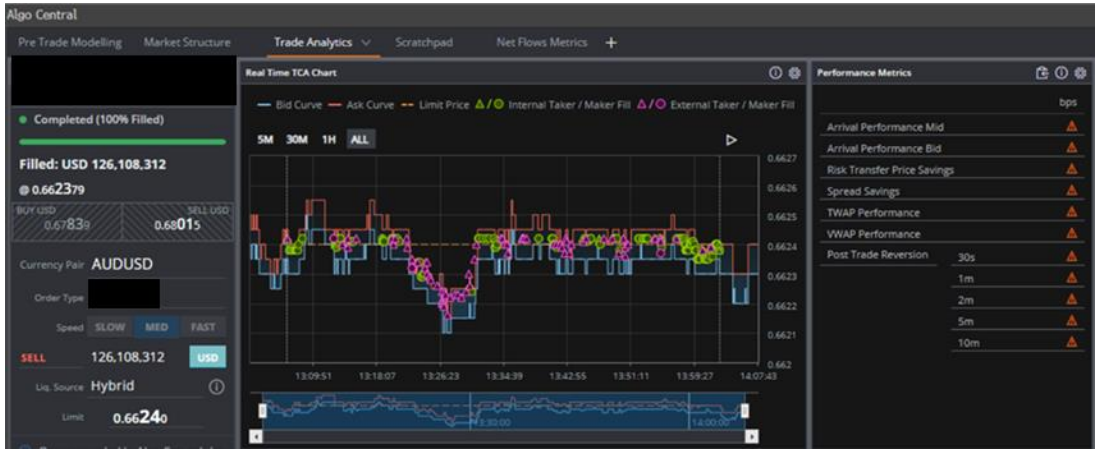
FX

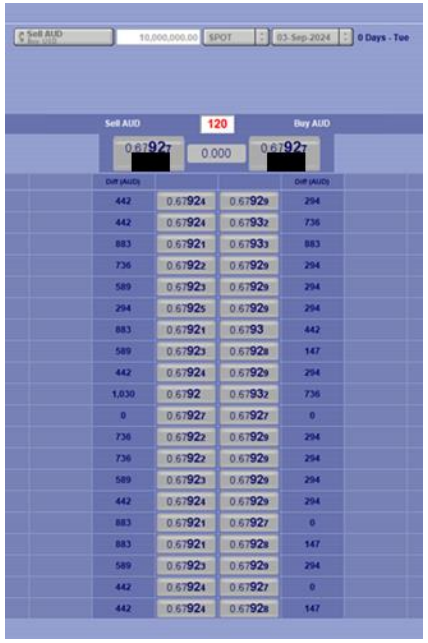
Why we trade FX

- Hedging exposure to foreign exchange rate risk associated with offshore assets
- Active bets (e.g. Long USDJPY)
- Managing AUD exposure

Avenues to Market

- Over 25 CCYs across DM and EM Markets
- Algorithmic Trading
- Electronic Request for Quote
- Risk Transfer
- Worked order





Dealing

Real Time Example

US CPI Print

Dealing

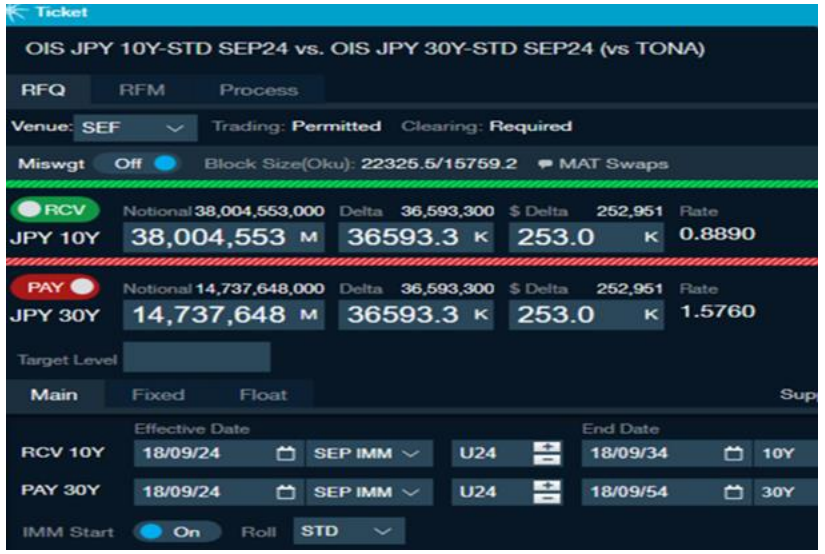
Fixed Income

Australian Market

- Interest rate differentials
- Australian Government issues ACGBs to finance their debt
- Expression of view on different state budget/performance
- OTC market – not exchange traded

Global Market

- Expression of views in what Central Banks will do next
- Performance of one country vs another



INSTRUMENT	$B	BID	OFFER
ACGBNov25	20	28.56	24.96
ACGBApr26	20	10.55	4.55
ACGBSep26	20	2.00	-1.20
ACGBApr27	20	-3.00	-5.00
ACGBNov27	20	-2.30	-3.90
ACGBMay28	20	-0.20	-1.50
ACGBNov28	20	3.10	1.80
ACGBApr29	20	7.70	6.11
ACGBNov29	20	13.80	12.24
ACGBMay30	20	19.40	17.85
ACGBDec30	20	29.20	27.46

Semi

		EFP	
INSTRUMENT	$B	BID	OFFER
TCVNov25	10	11.47	-8.53
TCV26	10	5.87	-0.50
TCV27	10	17.20	13.55
TCV28	10	33.75	29.24
TCV29	10	53.11	48.95
TCVNov30	10	76.63	72.03

AustralianSuper

Opportunities

Opportunities

Maths at AustralianSuper

Dealing

Asset Allocation

- Risk modelling

Exposure Management

- Modelling daily exposures based on market moves to ensure our allocations are where we expect them
- Modelling to understand peer allocations and optimal sizes for rebalancing bands
- Stress Testing Cashflows
  - The impact of a crisis on superannuation fund liquidity and how trustees might respond to any shortfalls

Quant Equities/Fixed Income and Currency

- Buying/selling based on signals generated by market movements ie momentum, value

Actuary

- Specialising in forecasting member cash flows based on economic factors ie age of members, number of new members

	Current				
Tenor	Factor 1	Factor 2	Factor 3	Factor 4	Net
CCY 1			-0.009y		-0.009y
	+0.021y	-0.021y	-0.007y	-0.021y	-0.028y
	+0.021y	-0.021y	-0.007y	-0.021y	-0.028y
	+0.021y	-0.021y			
CCY 2	-0.021y	+0.021y	-0.003y		-0.003y
	-0.021y	+0.021y	-0.004y		-0.004y
CCY 3	+0.021y		-0.002y	+0.021y	+0.040y
	+0.021y		-0.003y	+0.021y	+0.039y
CCY 4	-0.021y		-0.003y	+0.021y	-0.003y
			-0.004y	+0.021y	+0.017y
	0.000y	+0.000y	-0.048y		-0.048y

AustralianSuper

Summary

Summary

Financial Markets

- Fast paced and challenging – every day is different and requires 100% effort and attention
- Instant feedback
- Incredibly rewarding – working for people who would not otherwise be investing
- Travel the world – financial hubs like London, New York, Hong Kong, Singapore
- High earning potential
- Diversity of roles and responsibilities

Pathways/Knowledge for students

So many internship and grad programs available – start thinking about these in your first and second year of university

Industry experience is invaluable

Your STEM degree will make you stand out

Gender specific targets at AS:

- Gender balance overall, board level and key management positions
- Must have women on panel to attend or present

Investment Banks, Superfunds, Fund Managers

It's OK to stay broader for longer, study a STEM degree without a specific career in mind

Let your interests guide your career

AustralianSuper

Thank you

It’s Australian.
It’s super.
And it’s yours.

Dr Adrian L Malec

AI-Law Researcher and Backend Developer,
MinterEllison

My Background

- AI Researcher and Backend Developer at **MinterEllison**
- PhD in Astrophysics at **Swinburne University of Technology**
- Double Degree in Science and Engineering at **Swinburne University of Technology**
- Part time Juris Doctor (law) student at **University of Melbourne**
- Over 15 years of tertiary teaching experience at **Swinburne University of Technology**
- Worked as a research assistant, executive assistant, web developer and professional photographer

Math and Careers

- Math is **everywhere**
- You need to **know** math to understand how the modern world works
- You need to be **comfortable** with math to make original ideas a reality
- Math can **change** the world
- Being **friends** with math will open career pathways to students

MinterEllison.

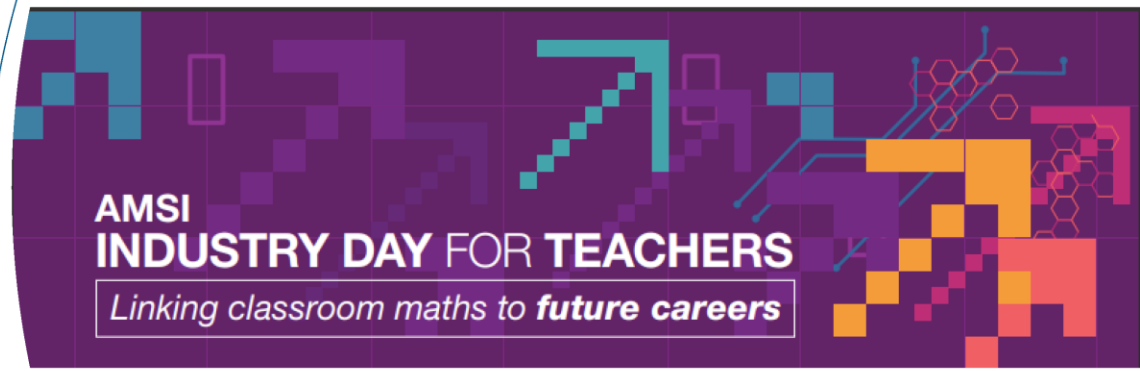
minterellison.com

Mr Joseph Widaglo

Lead Operations Research Scientist,
Dassault Systèmes

MATHEMATICS & MY CAREER

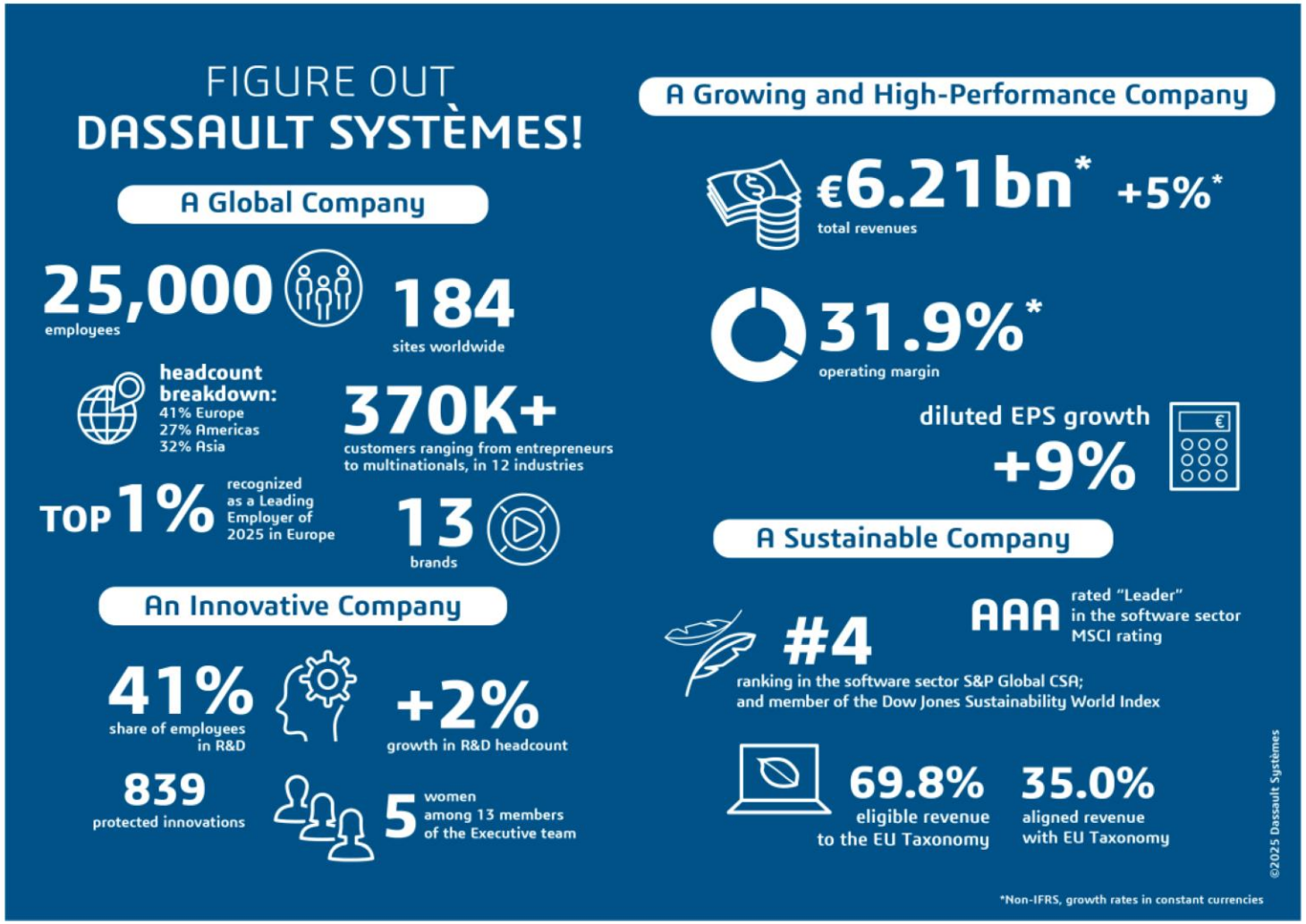
Joseph Widagdo



INTRODUCTION

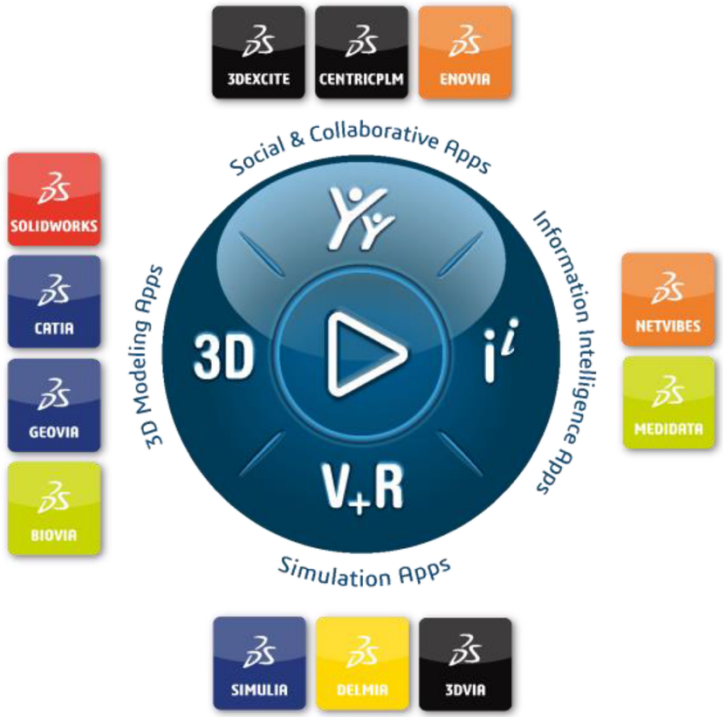
Who We Are

- Dassault Systèmes is a 40+ year old company dedicated to helping improve products, processes, and the lives of people.
- Our roles span across solution consulting, industry processes, and business transformation
- Passionate about connecting mathematical thinking to global challenges

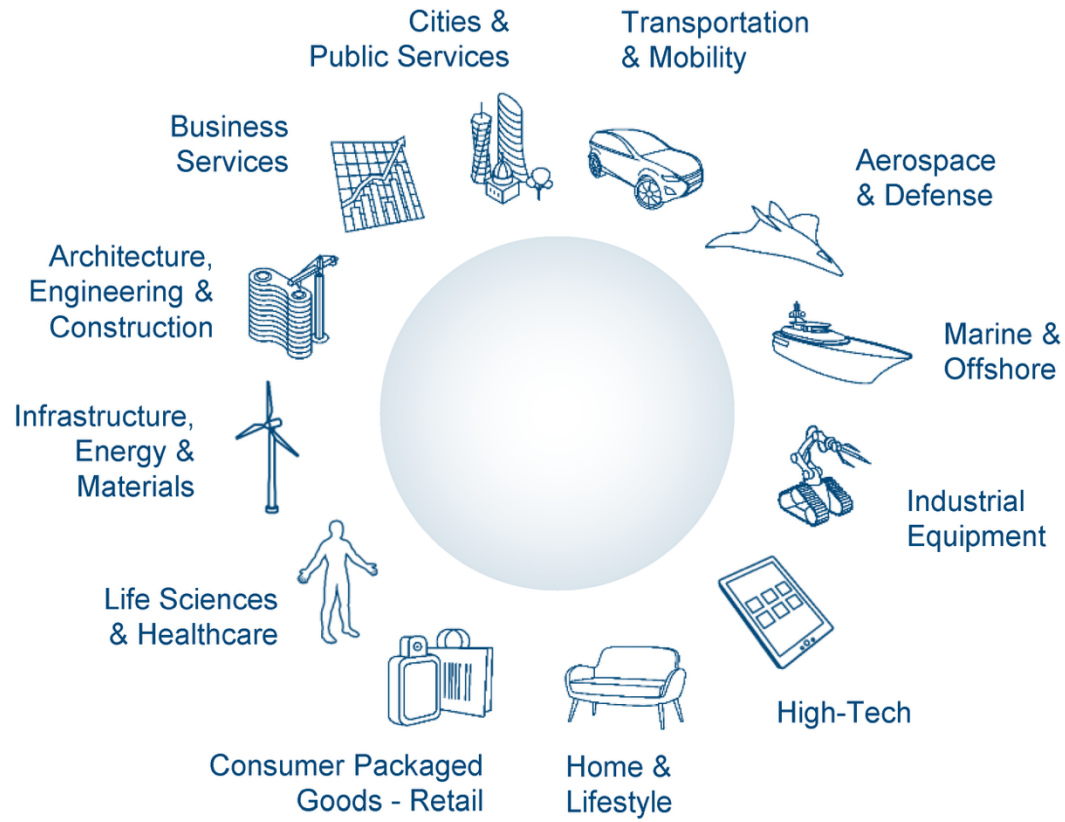


OUR COMPANY'S REACH

We Support 12 Global Industries

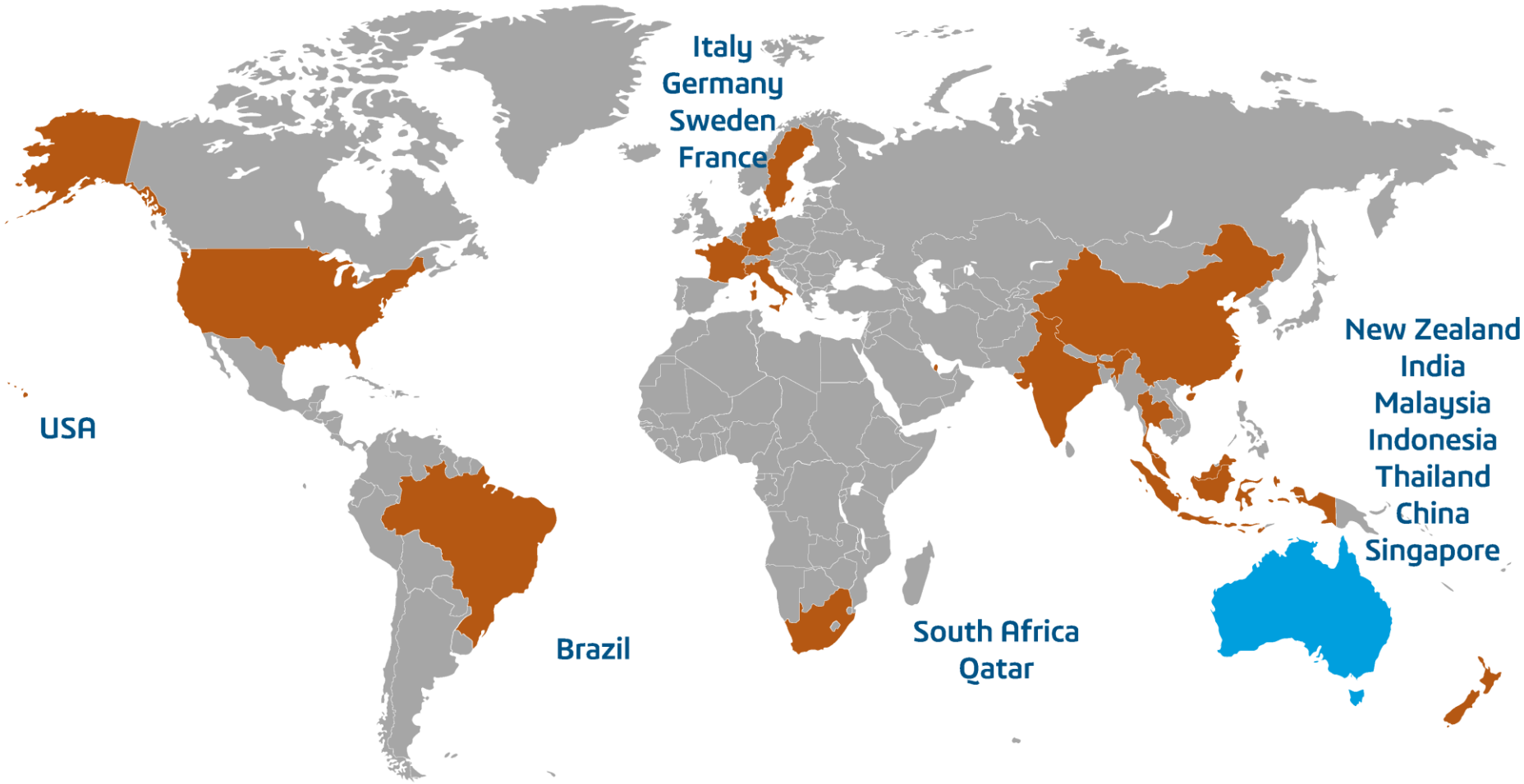


Our platform, the 3DEXPERIENCE®, connects data, models, and simulations



Mathematics is foundational in everything we do – from product design to logistics optimization

OUR ENGAGEMENTS



EVERYDAY MATHS: THE TRAIN EXAMPLE

Where's the Train? A Mathematical Puzzle

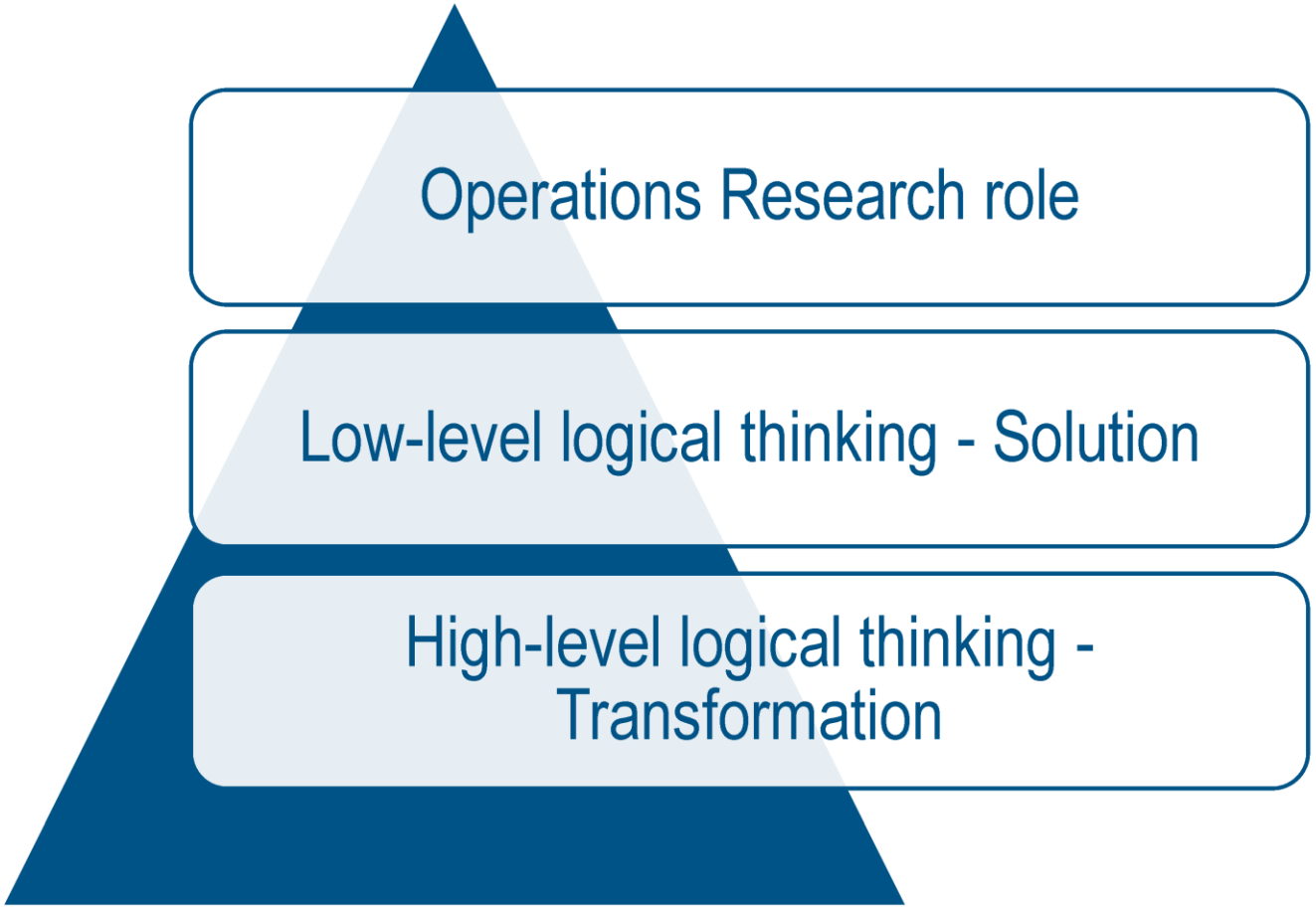
Source: My3DEXPRIENCE

What goes into your morning Train to university?

- Service Planning: Routes and schedules
- Crew Allocation: Qualified drivers' availability
- Rolling Stock Management: Which train is where?
- Timetable Optimization: Coordinating multiple services

HOW MATHEMATICS HELPED ME

How Maths Shaped My Career



INSPIRATION TO STUDY MATHEMATICS

Why I Chose Mathematics

Critical thinking more important than ever, professionally or otherwise

Creative professionals will harness AI to become irreplaceable, not be replaced.

Fascination with how things work: systems, processes, technology

Math gave us a toolkit to understand and change the world

INTERN LIFE

Logic is the beginning of wisdom, not the end.

- Leonard Nimoy

Q&A Panel with Meghna, Oliver, Adrian and Joseph

DISCOVER MORE ON 3DS.COM

Morning Tea

AMSI CAREERS VIDEOS

Professor Federico Frascoli

Swinburne University of Technology

Applied Mathematics

Its importance in (modern) industry

Prof Federico Frascoli – Head of Department

AMSI Maths in Industry DAY for Teachers

18th June 2025

SWINBURNE UNIVERSITY OF TECHNOLOGY

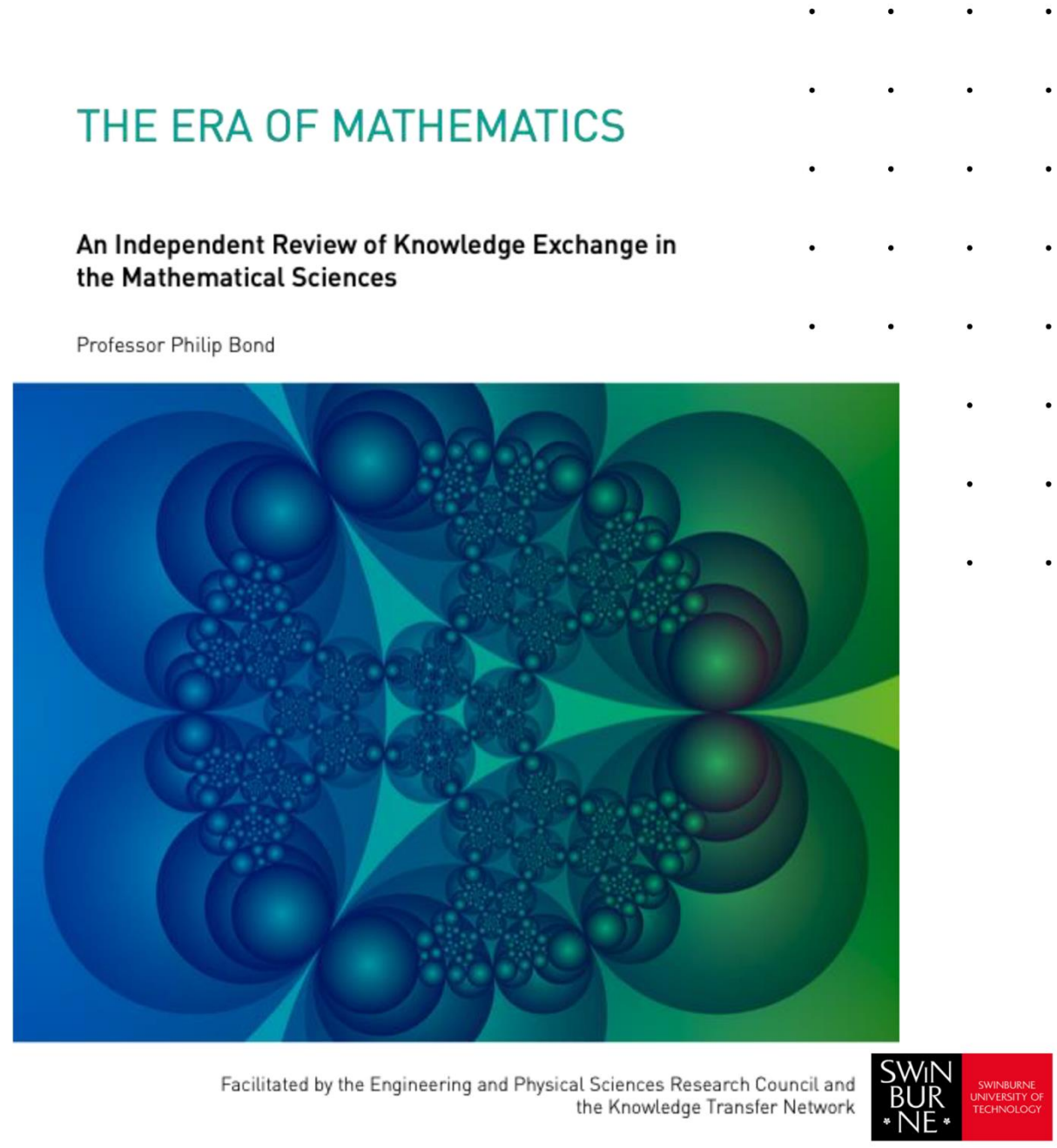
What is it? Why?

-- There is no “Applied Mathematics”, only “Applications of Mathematics”.

-- Mathematics is beautiful.

-- Data analysis, modelling of the physical world, fundamental theories.

-- Analytic and problem-solving skills are in high demand.



What will you learn in our Maths major?

-- Writing, solving and manipulating complex mathematical equations.

-- Coding, simulating and solving real-life problems.

-- Making sense of data, big and small.

-- Analysing patterns and order, in different contexts.

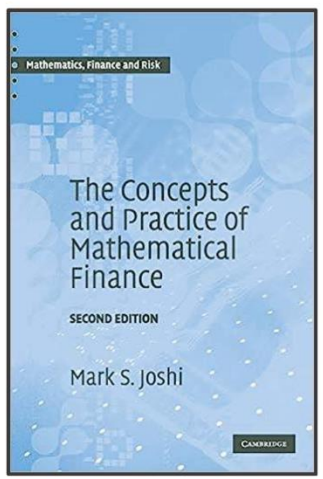
-- Understanding noise, errors and chance.

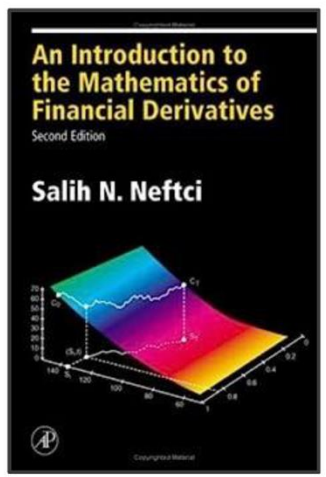
SWINBURNE UNIVERSITY OF TECHNOLOGY

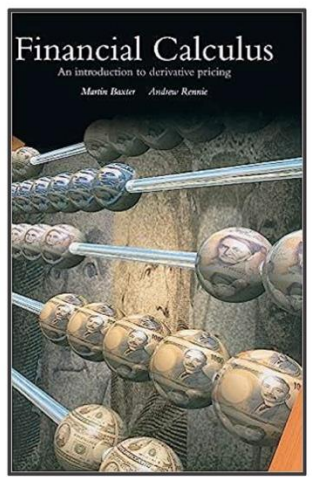
Financial modelling and risk

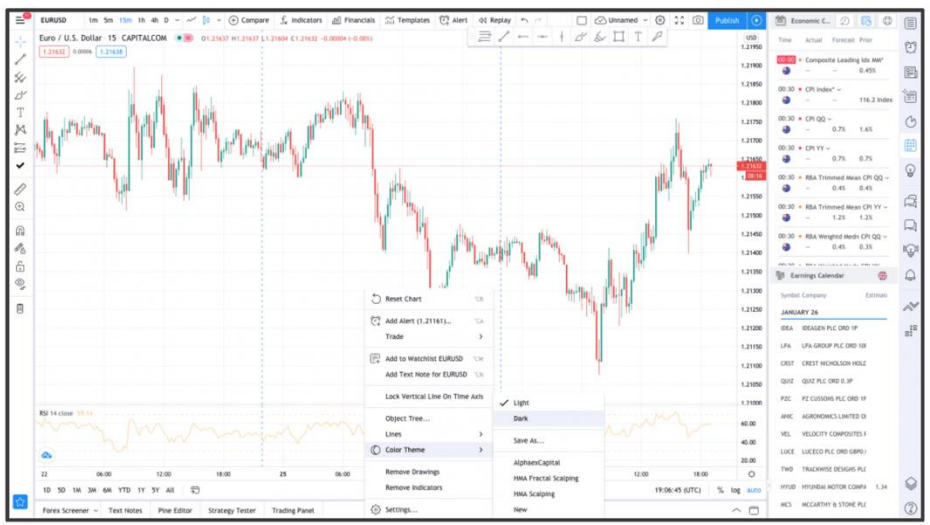
Black-Scholes-Merton PDE

$$\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} - rV = 0$$





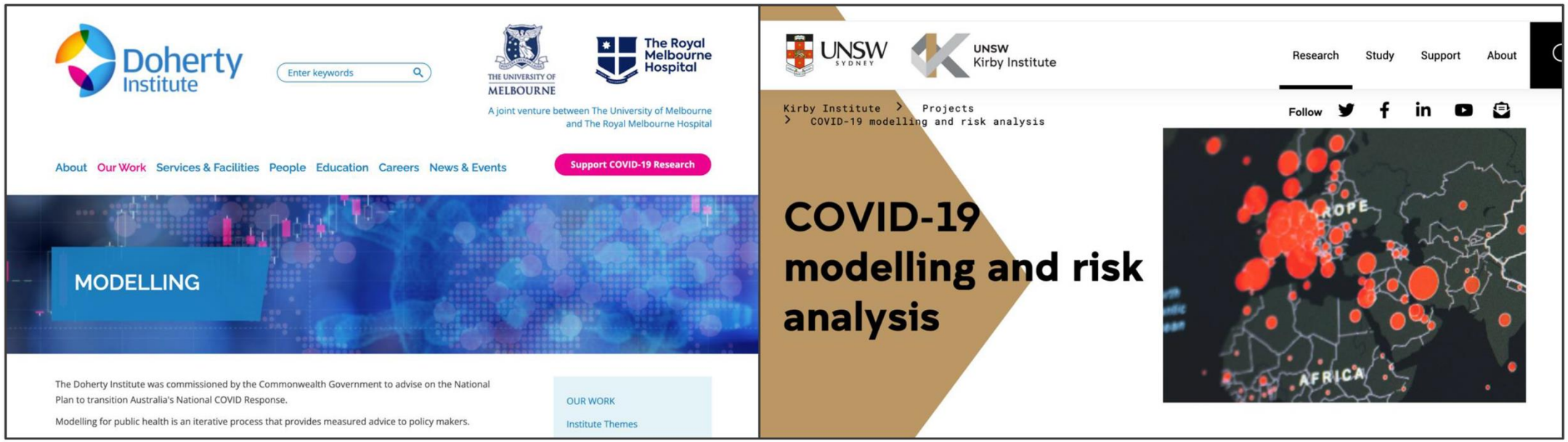


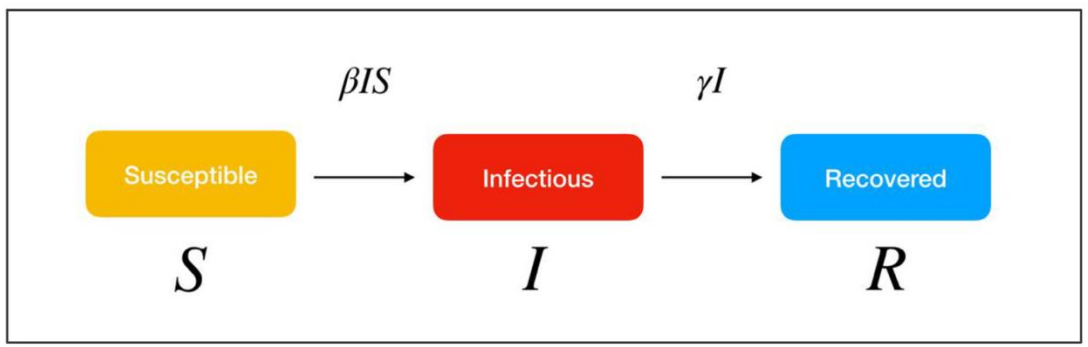


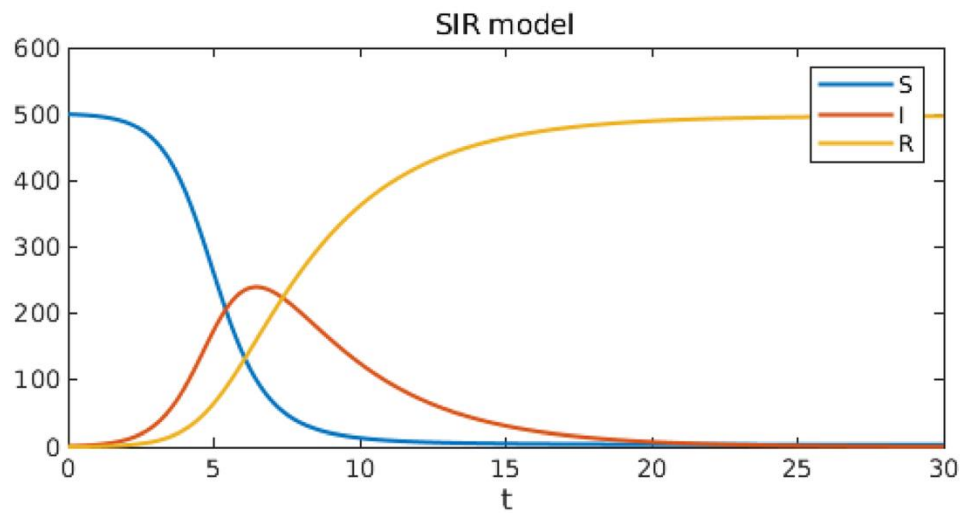
This field is ever-expanding and there is a huge request for graduates with applied mathematics degrees

SWINBURNE UNIVERSITY OF TECHNOLOGY

Infectious disease modelling

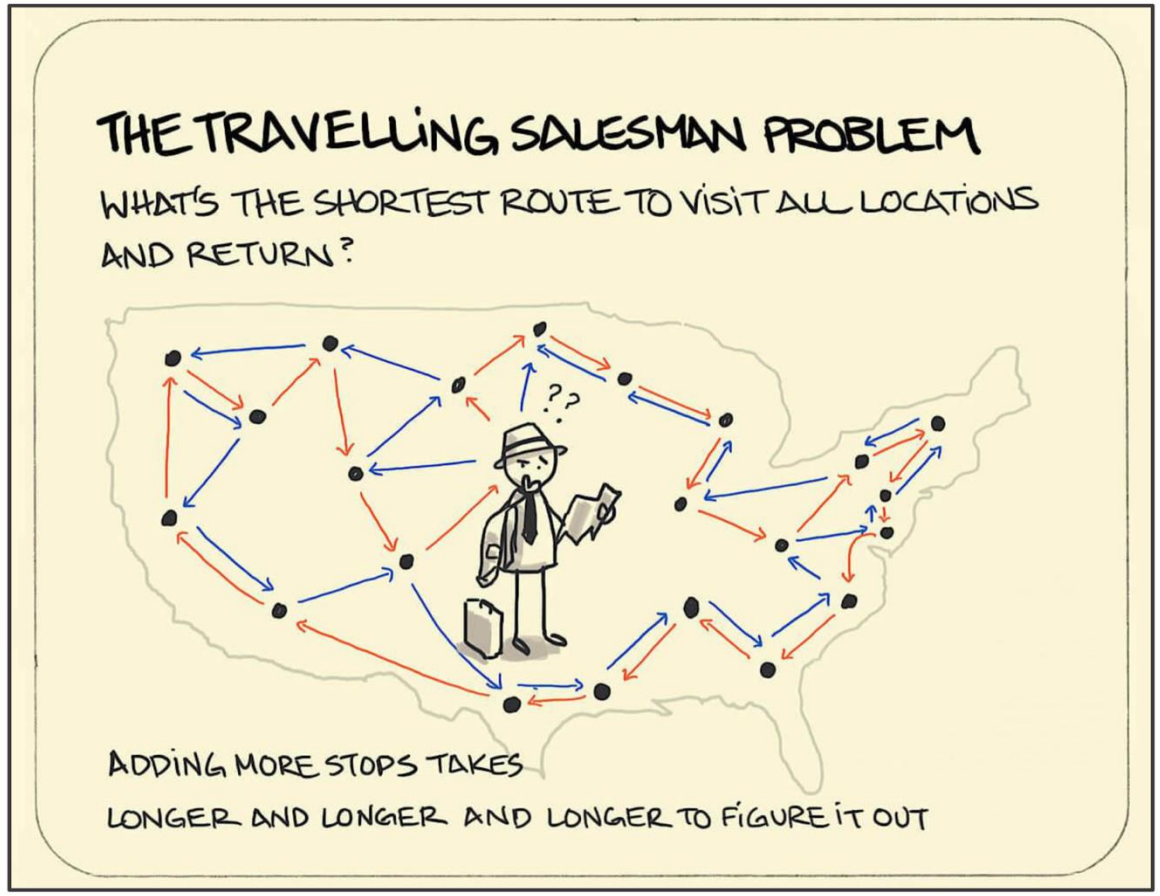






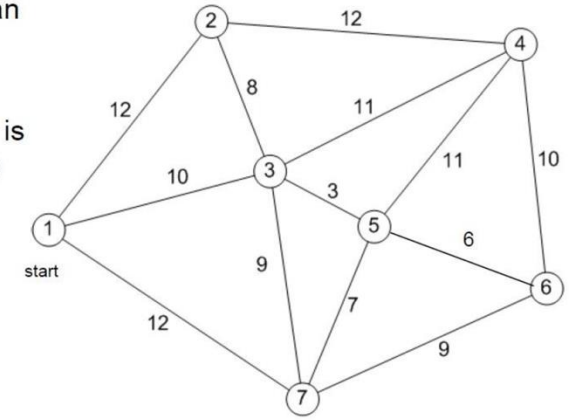
SWINBURNE UNIVERSITY OF TECHNOLOGY

Optimisation and supply chains



The Traveling Salesman Problem

- The salesman must travel to all cities once before returning home
- The distance between each city is given, and is assumed to be the same in both directions
- Objective - Minimize the total distance to be travelled



Why UPS drivers don't turn left and you probably shouldn't either

Published: January 20, 2017 10.58pm AEDT

Shutterstock

Email
Twitter 330
Facebook 4.7k
LinkedIn
Print

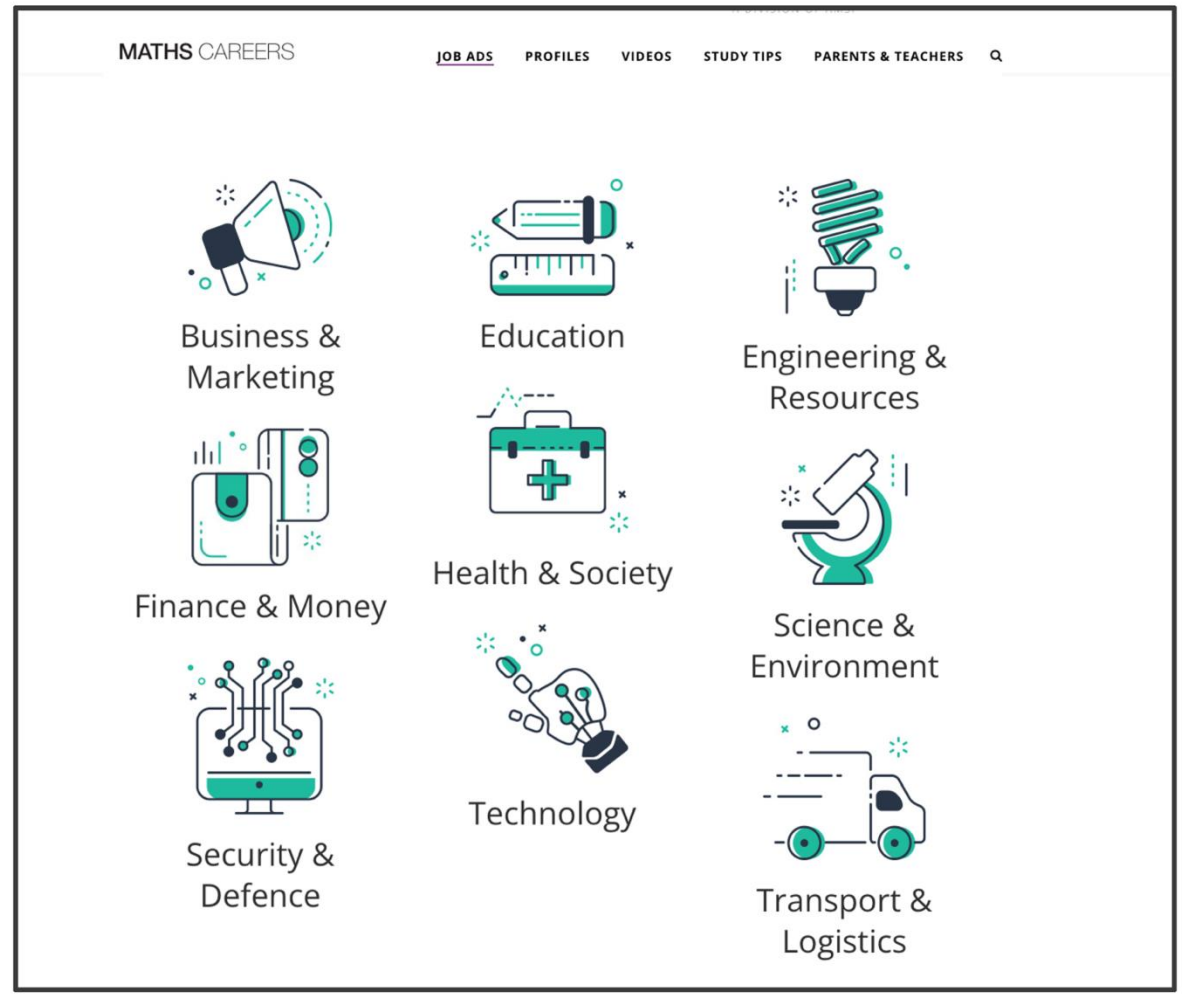
It might seem strange, but UPS delivery vans don't always take the shortest route between stops. The company gives each driver a specific route to follow and that includes a policy that drivers should never turn through oncoming traffic (that's left in countries where they drive on the right and vice versa) unless absolutely necessary. This means that routes are sometimes longer than they have to be. So, why do they do it?

The importance of this problem for industry and the environment is enormous!

SWINBURNE UNIVERSITY OF TECHNOLOGY

Applied Mathematics: Endless Careers

- Data Scientist and making sense of any data
- Everything AI, Deep Learning, ChatGPT
- Financial and Risk analyst, modeler, forecaster, banking
- Insurance, Pensions, Stockmarket
- Defense, Financial Crime, Cybersecurity
- Mathematical modeler (nature and society)
- Quantitative analyst (retail, bushfires, sport strategy etc)
- Meteorologist and climate experts
- Ecology, Conservation, Planning
- Secondary and tertiary teacher
- Consultancy (Big Four, Department of Housing, UN etc)



An unexpected, possible career?

- Pope Leo XIV holds a BSc in Mathematical Sciences from the University of Villanova

Employment Outcomes

In the US, three out of the ten highest paid jobs are in Mathematics:

- Data Scientists (1!)
- Mathematicians (6)
- Actuaries (10)

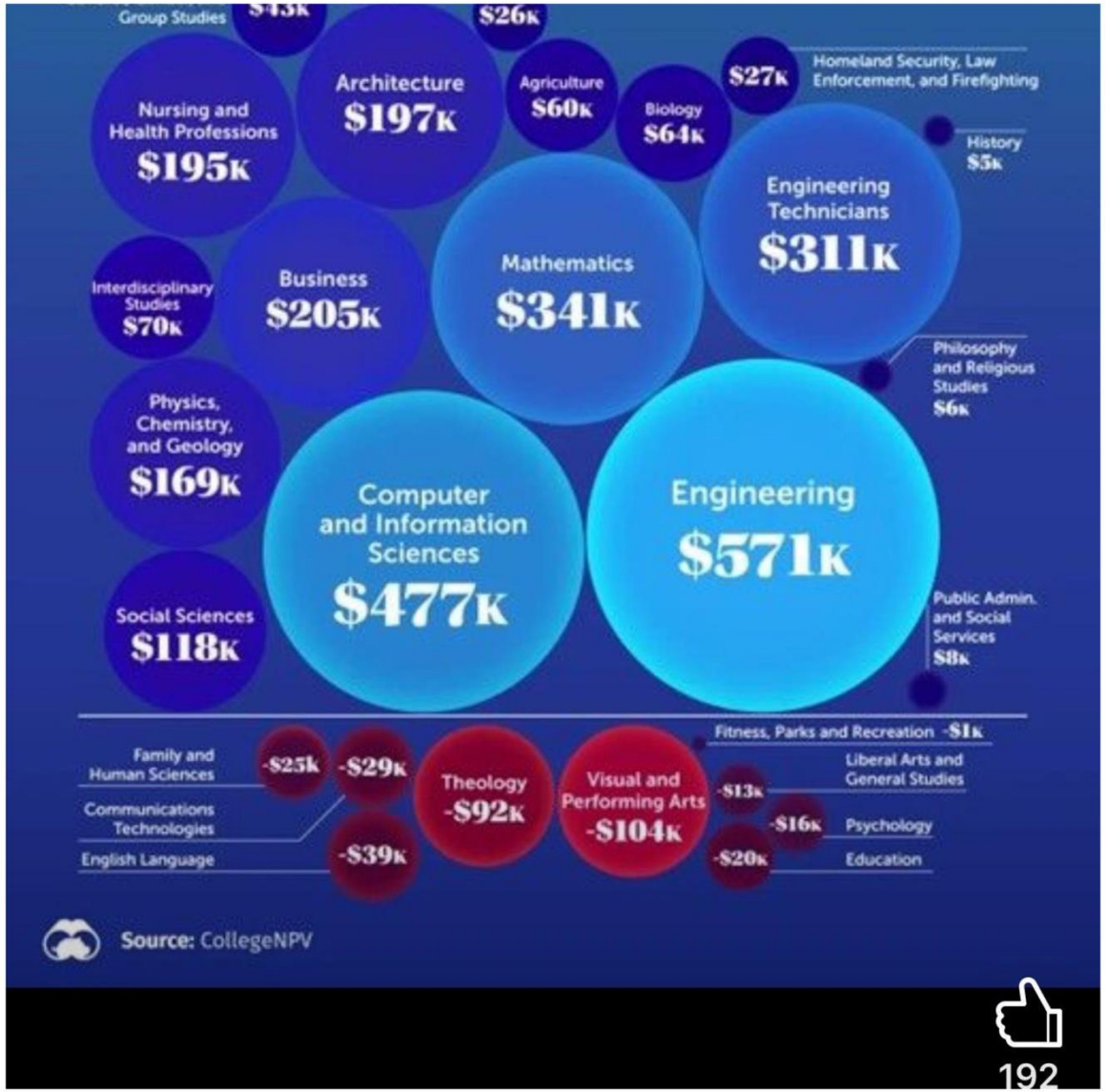
Starting salaries for graduates in Oz are in the range 80k-130k. For some starting positions (mining, intense coding and remote) we also saw 200k-400k (!!!)

There is large demand for mathematics' teachers in Australia and out of field teaching is widespread

The best candidate will be analytical, curious and self-motivated with a keen eye for detail, and an analytical mind. They are a natural collaborator, an excellent communicator, open to feedback and eager to work side-by-side with other high performing investment specialists.

SWINBURNE UNIVERSITY OF TECHNOLOGY

Some of the most rewarding careers are in Mathematics



Analytics and Data Science Contract! Remote Friendly from Syd, Melb, Bris

Talent Insights Group Pty Ltd

Sydney NSW

Mathematics, Statistics & Information Sciences (Science & Technology)

Contract/Temp

$750-$950 Per Day

Posted 28d ago

Automation Tester / Junior Quant Developer

Profusion PAC Pty Ltd

Melbourne VIC

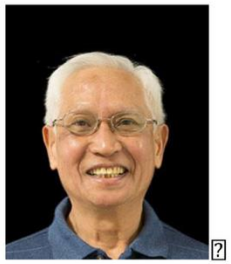
Testing & Quality Assurance (Information & Communication Technology)

Contract/Temp

$7-800 pd + GST min 12mths contract

Posted 2d ago

SWINBURNE UNIVERSITY OF TECHNOLOGY



Prof. Vo Anh
Adjunct Professor
Applied Mathematics

Dr Zhenzhen Chen
Academic Tutor
AD222

Dr Nathan Clisby
Senior Lecturer
EN710a
Statistical mechanics, computational mathematics

Dr Emily Cook
Senior Lecturer
TC101
STEM Education

Dr Ant Sowards
Senior Lecturer
EN602f
Mathematics Education

Prof. Federico Frascoli
Dept Chair and Professor
EN710d
Systems out of equilibrium

A/Prof. Paul Hernandez Martinez
Associate Professor
EN711b
Mathematics Education

Dr Louise Olsen-Kettle
Lecturer
EN702a
Materials modelling, damage mechanics

Dr Andriy Pototskyy
Senior Lecturer
EN708b
Stochastic Equations and Processes

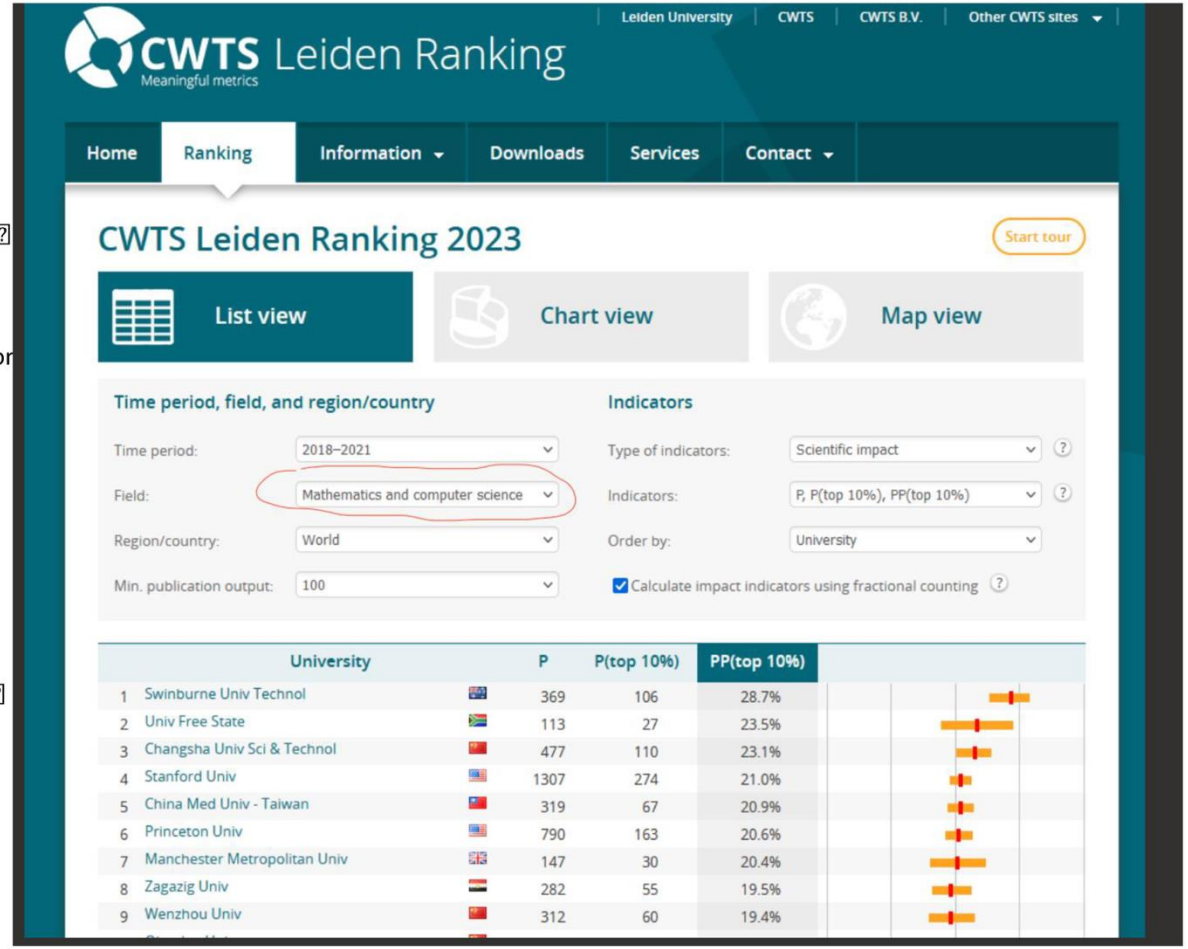
David Richards
Lecturer
EN708a
Statistics

Dr Nadezda Sukhorukova
Senior Lecturer
EN708f
Optimisation

Prof. Sergey Suslov
Professor
EN710e
Hydrodynamic Stability

Prof. Billy Todd
Professor
EN710b
Nonequilibrium statistical mechanics, molecular dynamics; computational nanofluidics

A/Prof. Tonghua Zhang
Associate Professor
EN708c
Dynamical Systems, Control



We love teaching and research

SWINBURNE UNIVERSITY OF TECHNOLOGY

Why study a Bachelor of Science at Swinburne?

- **Small student-oriented classes –** Get more one-on-one time and learn from approachable teachers in smaller classes when you choose Science at Swinburne. We are always available.

- **Early access to Labs & Facilities:** Get access to industry-standard labs from year one. When you choose Swinburne to study science, you're choosing real-world scientific practice alongside classroom-based theory.

- **Work Integrated Learning (WIL) –** Work on real industry projects problems from year 1 (for some majors) & Capstone Project in your final year of study.

- **Other reasons –** beautiful location and campus with a nice vibe. Many opportunities for international exchange (Europe, Asia and US). High employability.

SWINBURNE UNIVERSITY OF TECHNOLOGY

Course Structure

Flexibility to tailor degrees according to personal/professional choices.

Core Units

8 Units

Same for all Science students

+

Applied Mathematics Major

8 Units

May be printer on Testamur

+

OTHER STUDIES

8 Units

Co-Majors
Advanced Minors
Minors
Electives

Examples: AM (major) + Computer Science (+AI)
AM (major) + Data Science (+AI)
AM (major) + Physics
AM (major) + Biotech

SWINBURNE UNIVERSITY OF TECHNOLOGY

Thank you!

Questions?

SWINBURNE UNIVERSITY OF TECHNOLOGY

Dr Emily Cook

Swinburne University of Technology

AMSI Australian Mathematical Sciences Institute

The Invergowrie Foundation

Swinburne University of Technology

AustralianSuper

Bunnings

CFA

Texas Instruments

From Calculus to Cartoons: Maths and Animation

Dr Emily Cook
Senior Lecturer in STEM Education
Deputy Chair, Dept. of Mathematics
ejcook@swin.edu.au

Maths and Animation

- How I started…
- Animation to teach maths
- Maths in animation
- …Requests?

The problem – linear algebra online during Covid-19

Matrices
Vectors
Geometry
Transformations
Complex Numbers

SWINBURNE UNIVERSITY OF TECHNOLOGY

Multiplication Continued

Multiply rows by columns

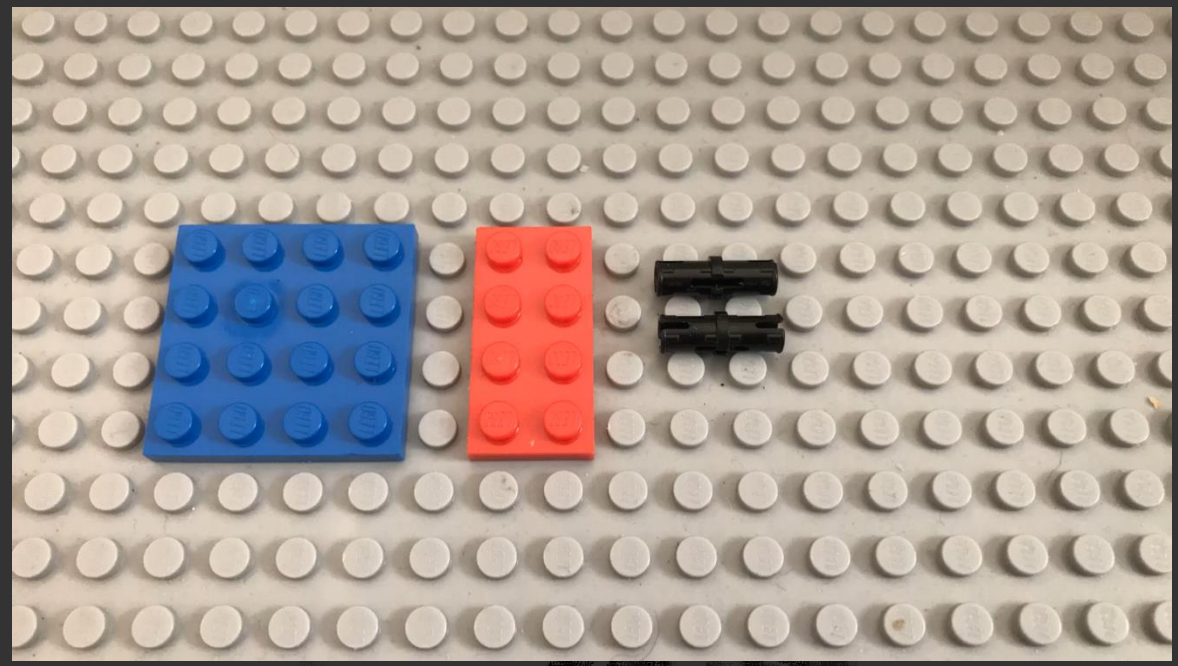
$$A = \begin{bmatrix} -5 & 3 \\ 2 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix}$$

Find AB $= \begin{bmatrix} -5 & 3 \\ 2 & 1 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix} = \begin{bmatrix} (-5\times2)+(3\times0) & (-5\times1)+(3\times-3) \\ (2\times2)+(1\times0) & (2\times1)+(1\times-3) \end{bmatrix} = \begin{bmatrix} -10 & -14 \\ 5 & -1 \end{bmatrix}$

Can you multiply BA?
Find BA $= \begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix}\begin{bmatrix} -5 & 3 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} (2\times-5)+(1\times2) & (2\times3)+(1\times1) \\ (0\times-5)+(-3\times4) & (0\times3)+(-3\times1) \end{bmatrix} = \begin{bmatrix} -8 & 7 \\ -6 & -3 \end{bmatrix}$

AB not the same as BA

NOT Commutative



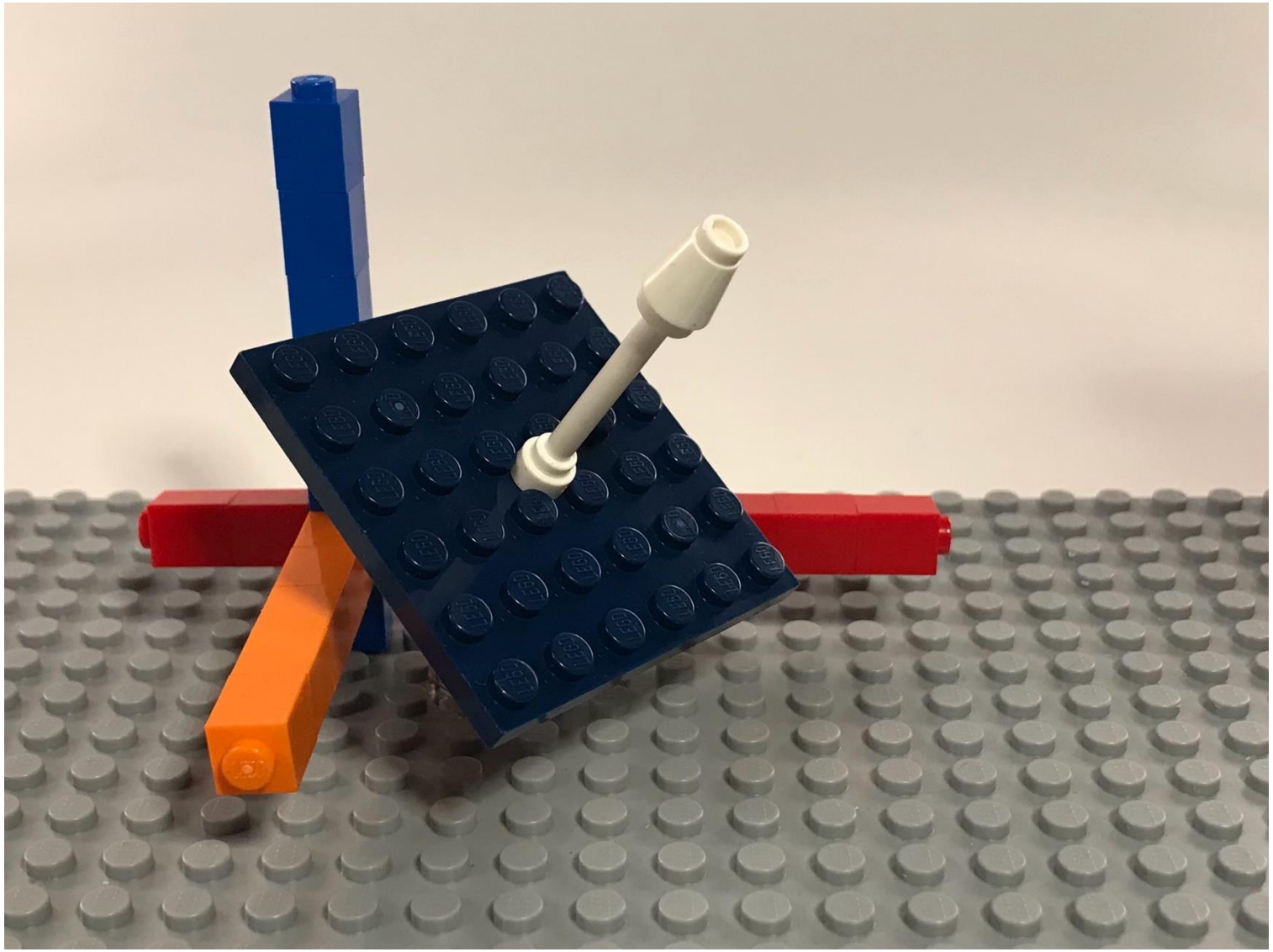
Using Lego® stop-motion animation

Least time-efficient method of creating teaching resources vs Fun!

- Reinforcing Processes
- Physical Models
- Introduction to concepts
- Problem Solving

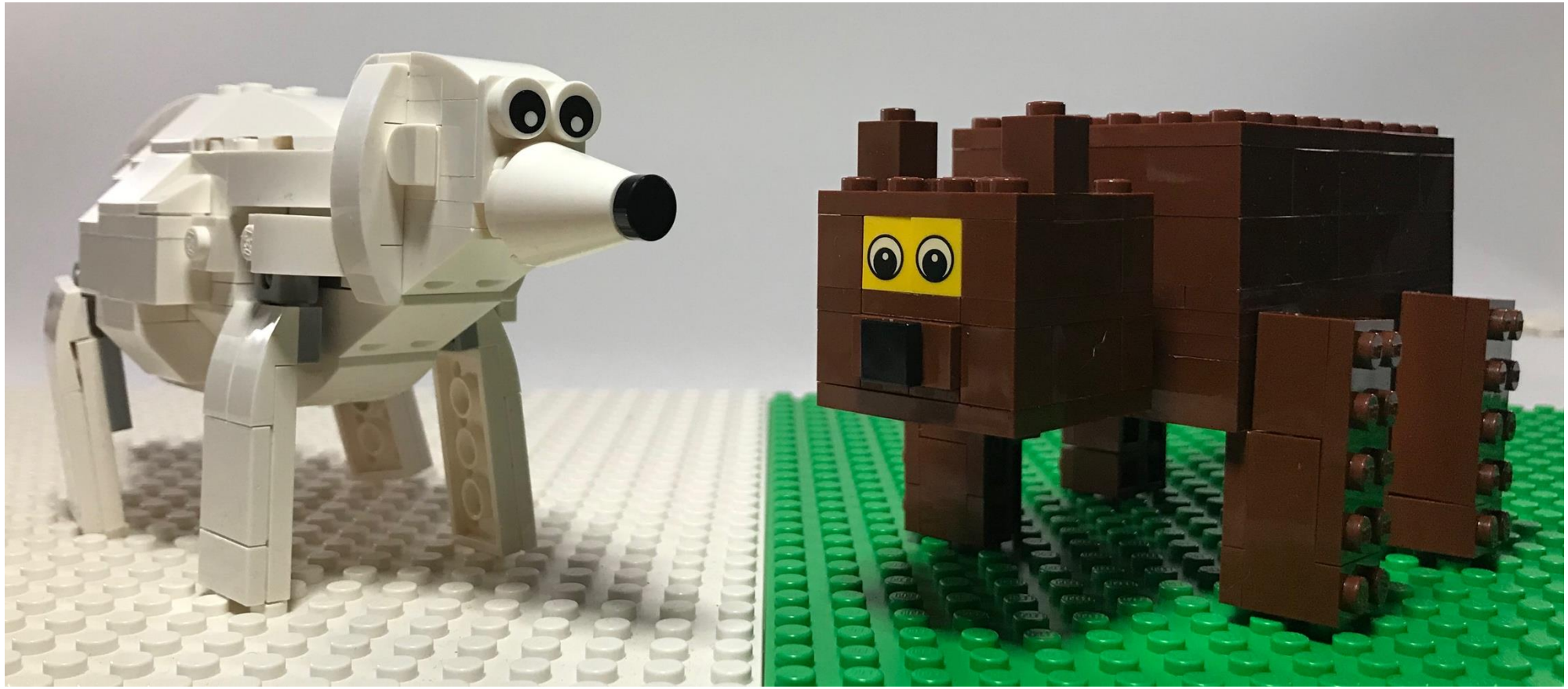
SWINBURNE UNIVERSITY OF TECHNOLOGY

Physical Models



SWINBURNE UNIVERSITY OF TECHNOLOGY

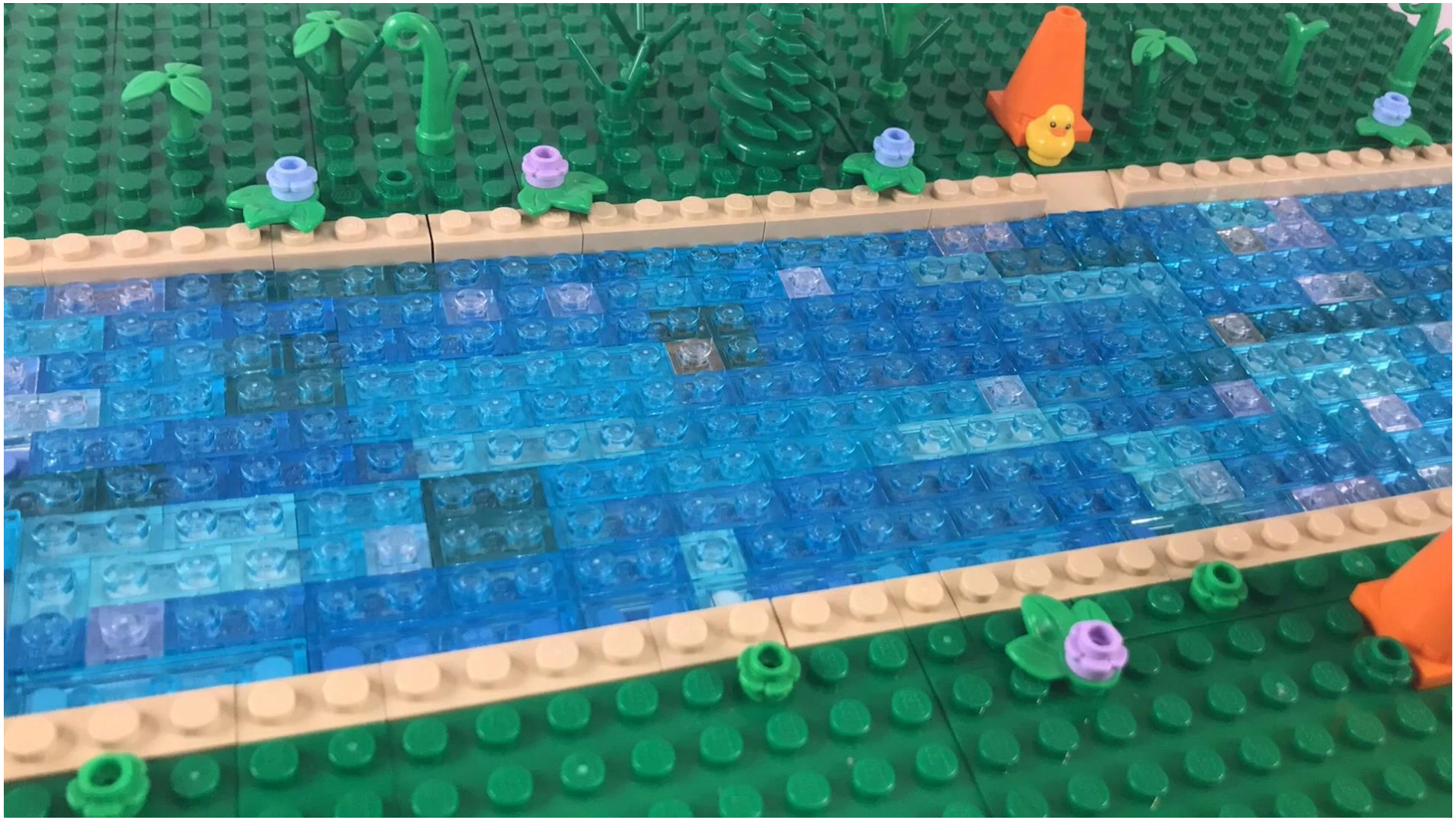
Introducing Concepts



Polar bear (r, θ)

Cartesian bear (x, y)

Problem Solving – from concrete to abstract

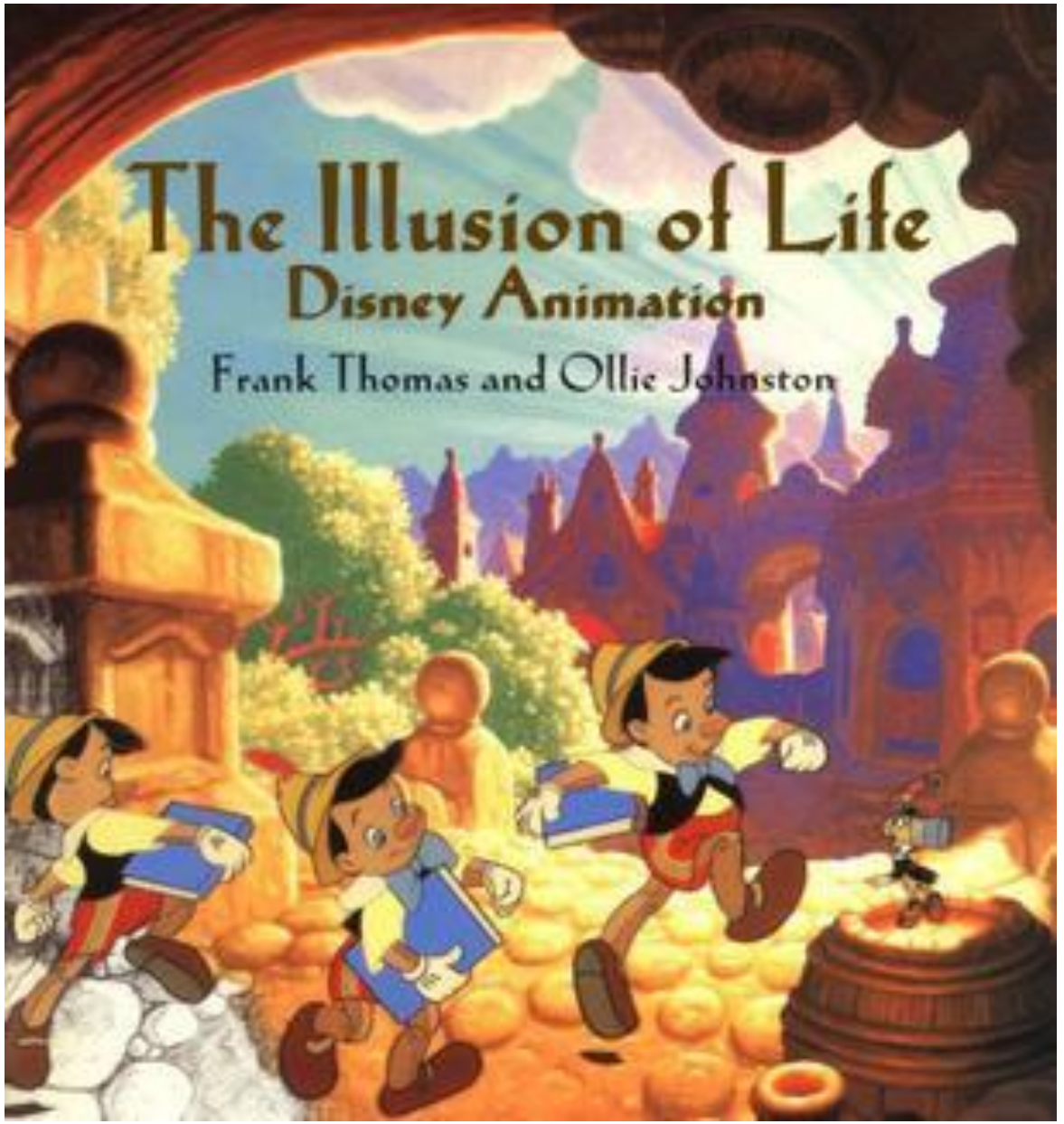


SWINBURNE UNIVERSITY OF TECHNOLOGY

SWINBURNE UNIVERSITY OF TECHNOLOGY

12 Principles of Animation

1.Squash and stretch
2.Anticipation
3.Staging
4.Straight-ahead action and pose-to-pose
5.Follow through and overlapping action
6.Slow in and slow out
7.Arcs
8.Secondary action
9.Timing
10.Exaggeration
11.Solid drawing
12.Appeal

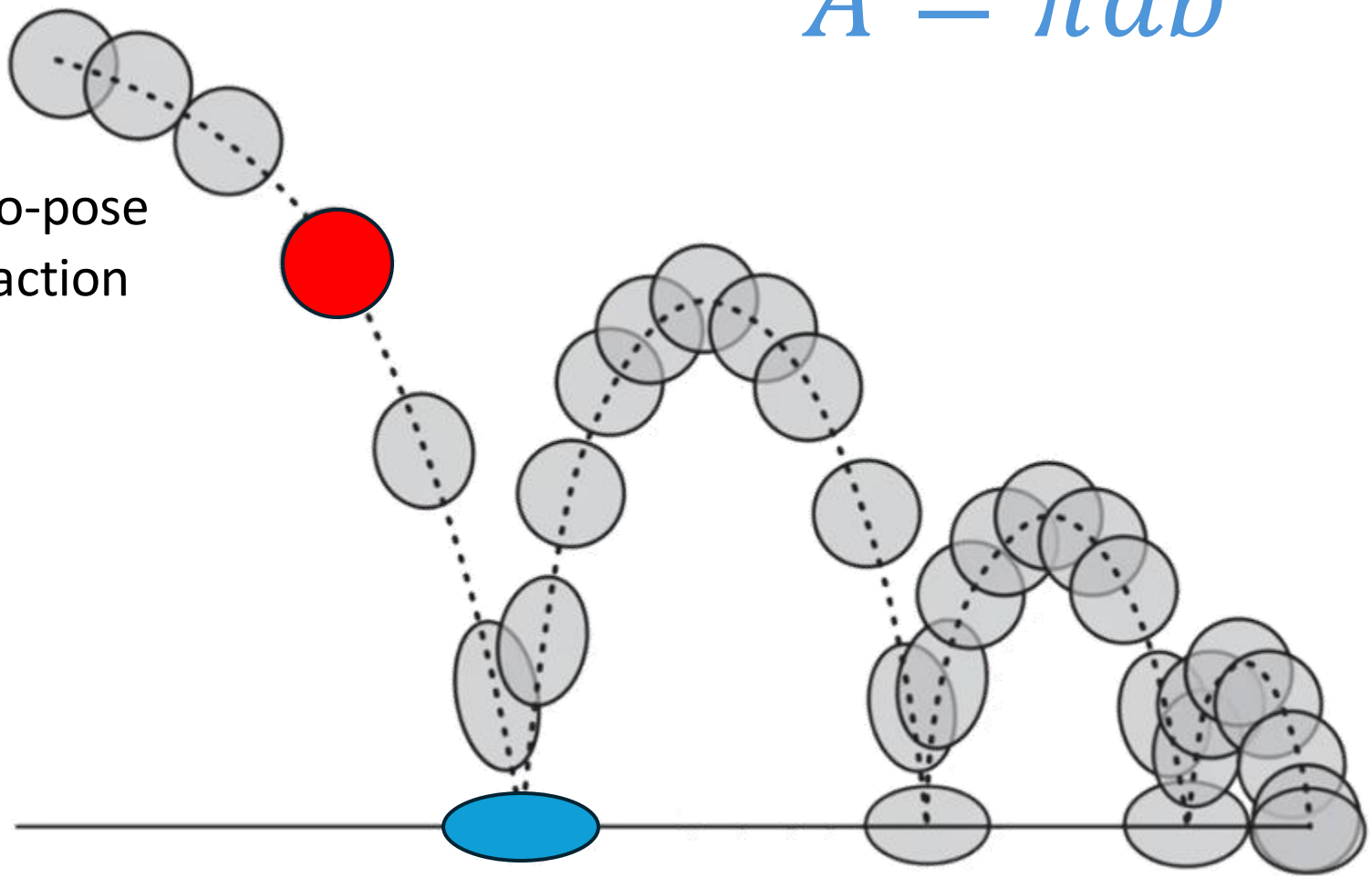


12 Principles of Animation

$$A = \pi r^2$$

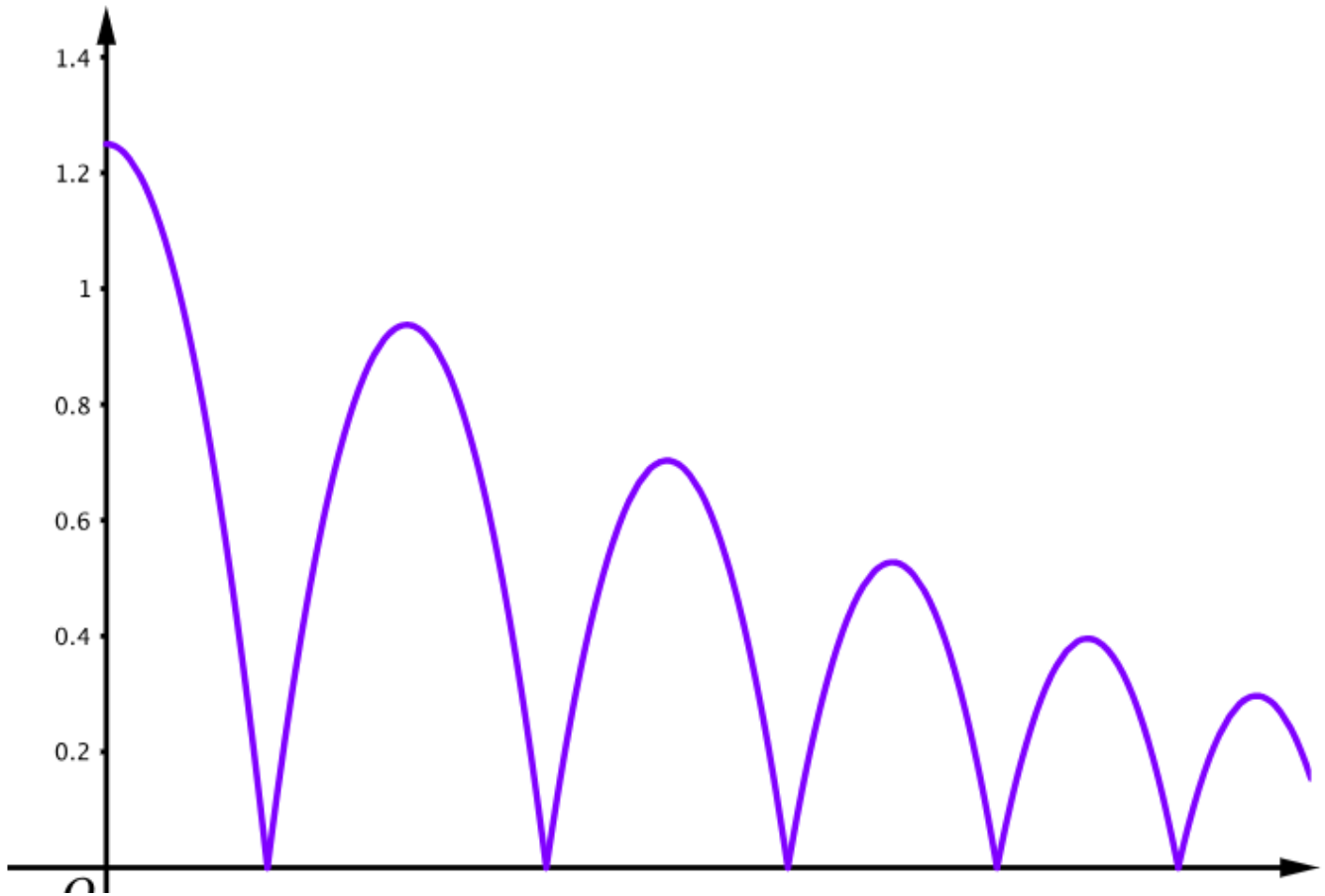
$$A = \pi a b$$

1.Squash and stretch
2.Anticipation
3.Staging
4.Straight-ahead action and pose-to-pose
5.Follow through and overlapping action
6.Slow in and slow out
7.Arcs
8.Secondary action
9.Timing
10.Exaggeration
11.Solid drawing
12.Appeal

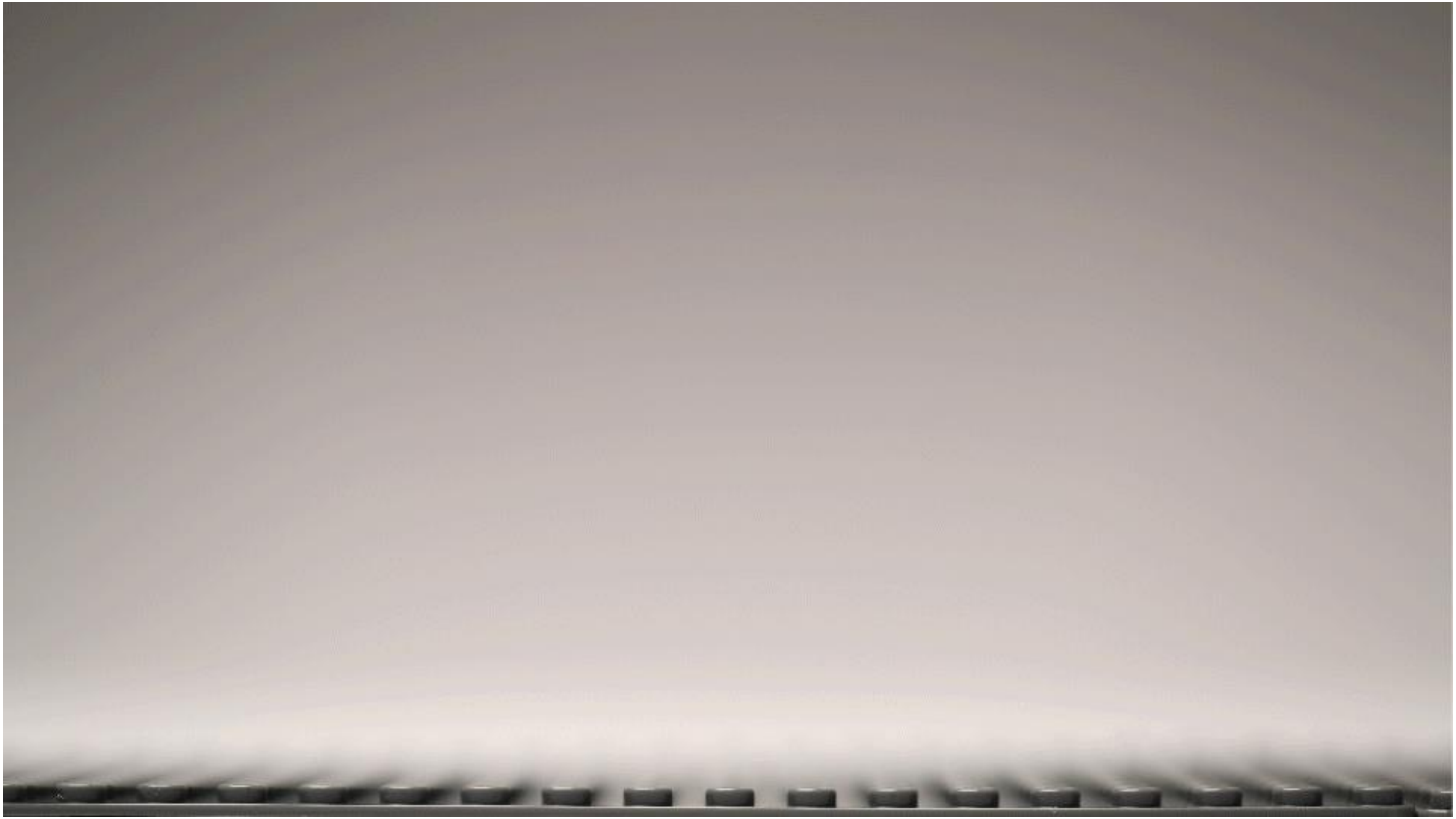


A ball is thrown horizontally at a speed of $2\,\mathrm{m\,s^{-1}}$ from a point $1.25\,\mathrm{m}$ above O which is on a flat horizontal surface. After each bounce it reaches a height which is 75% of its maximum height after the previous bounce. Ignore air resistance and take the acceleration of gravity, g, to be $10\,\mathrm{m\,s^{-2}}$.

- Sketch the trajectory of the ball.



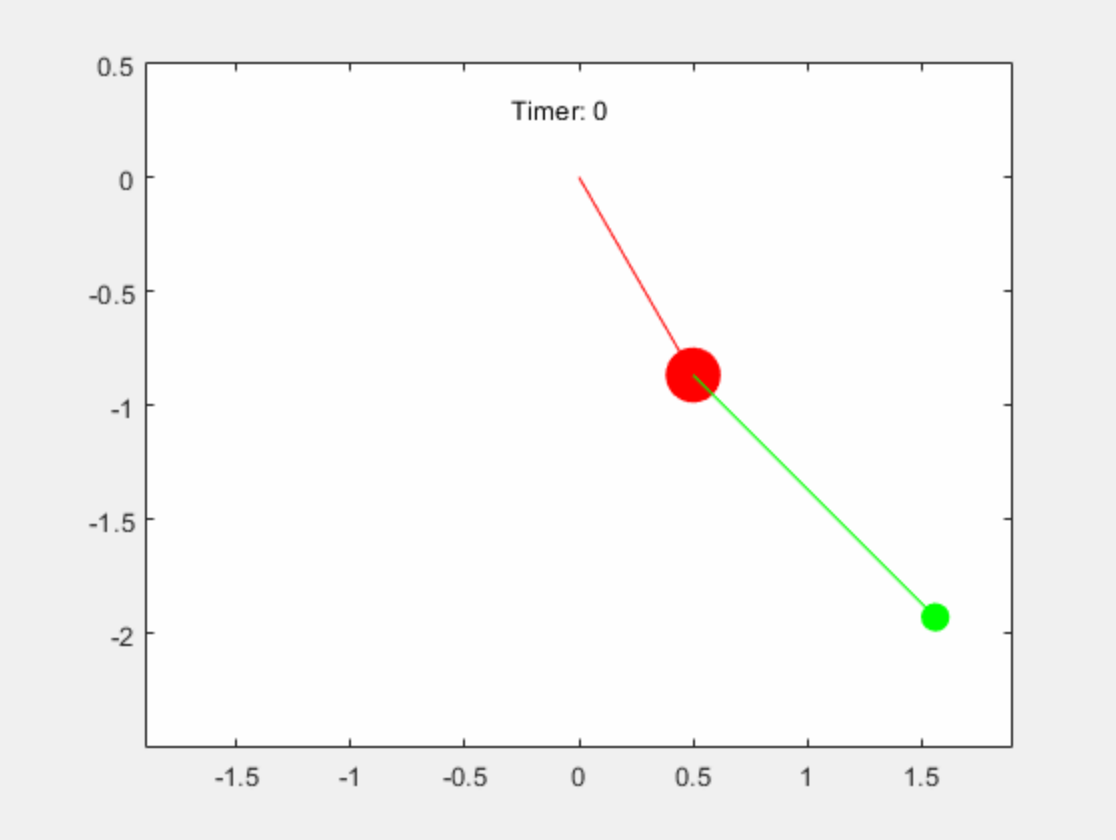
https://undergroundmathematics.org/sequences/bouncing-to-nothing/solution



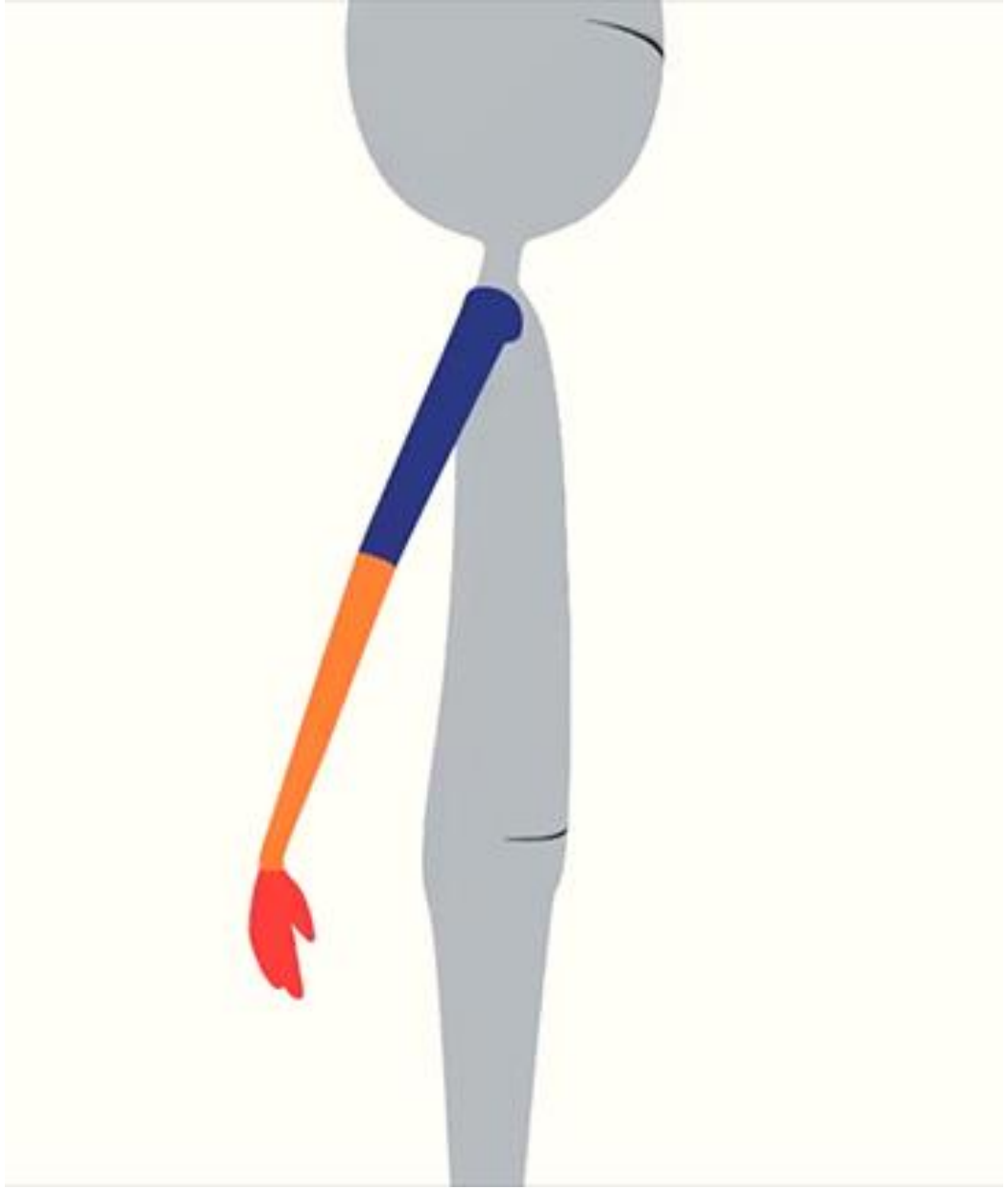
12 Principles of Animation

1.Squash and stretch
2.Anticipation
3.Staging
4.Straight-ahead action and pose-to-pose
5.Follow through and overlapping action
6.Slow in and slow out
7.Arcs
8.Secondary action
9.Timing
10.Exaggeration
11.Solid drawing
12.Appeal

Overlapping Action



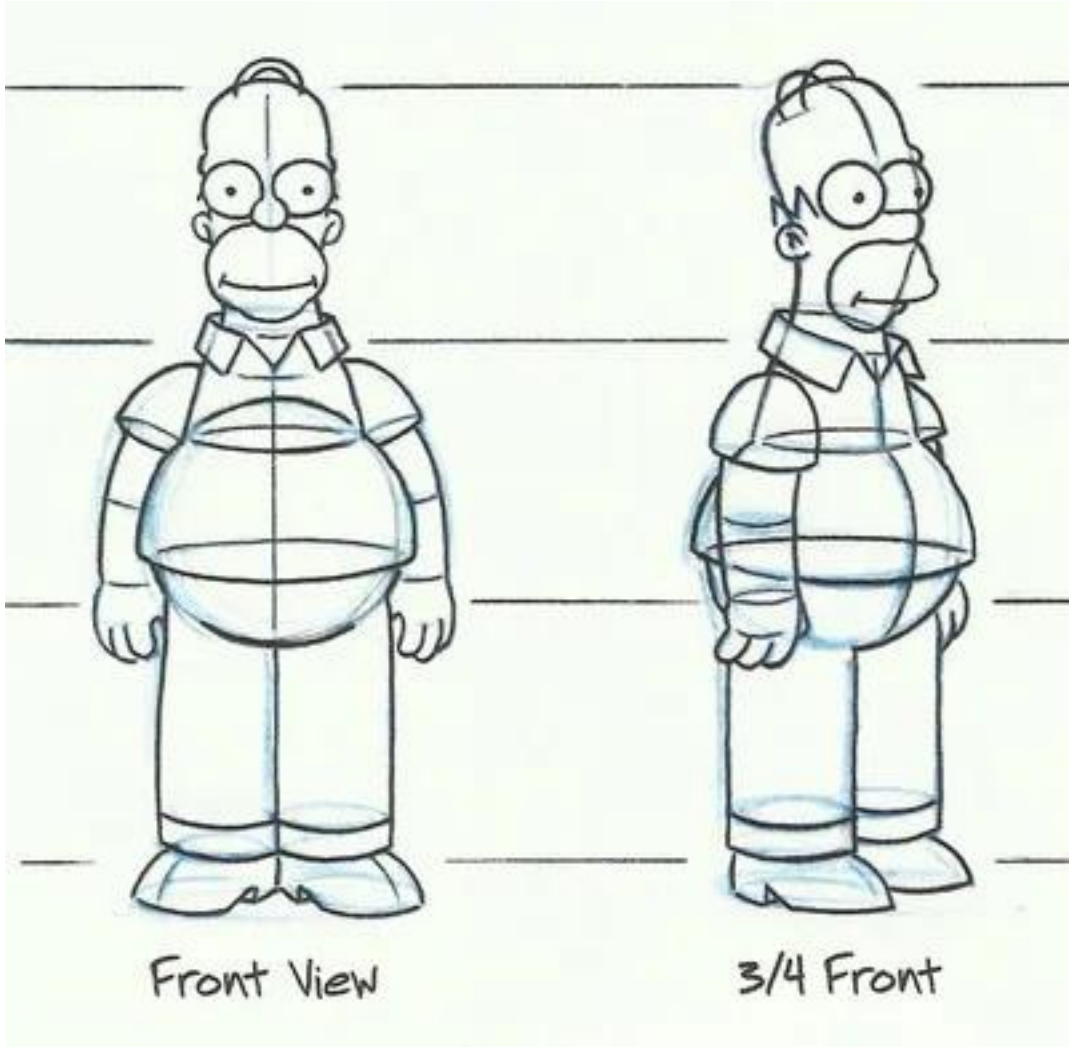
https://au.mathworks.com/help/symbolic/animation-and-solution-of-double-pendulum.html



https://iwanttobeananimator.wordpress.com/2017/08/29/lesson-9-follow-through-and-overlapping/

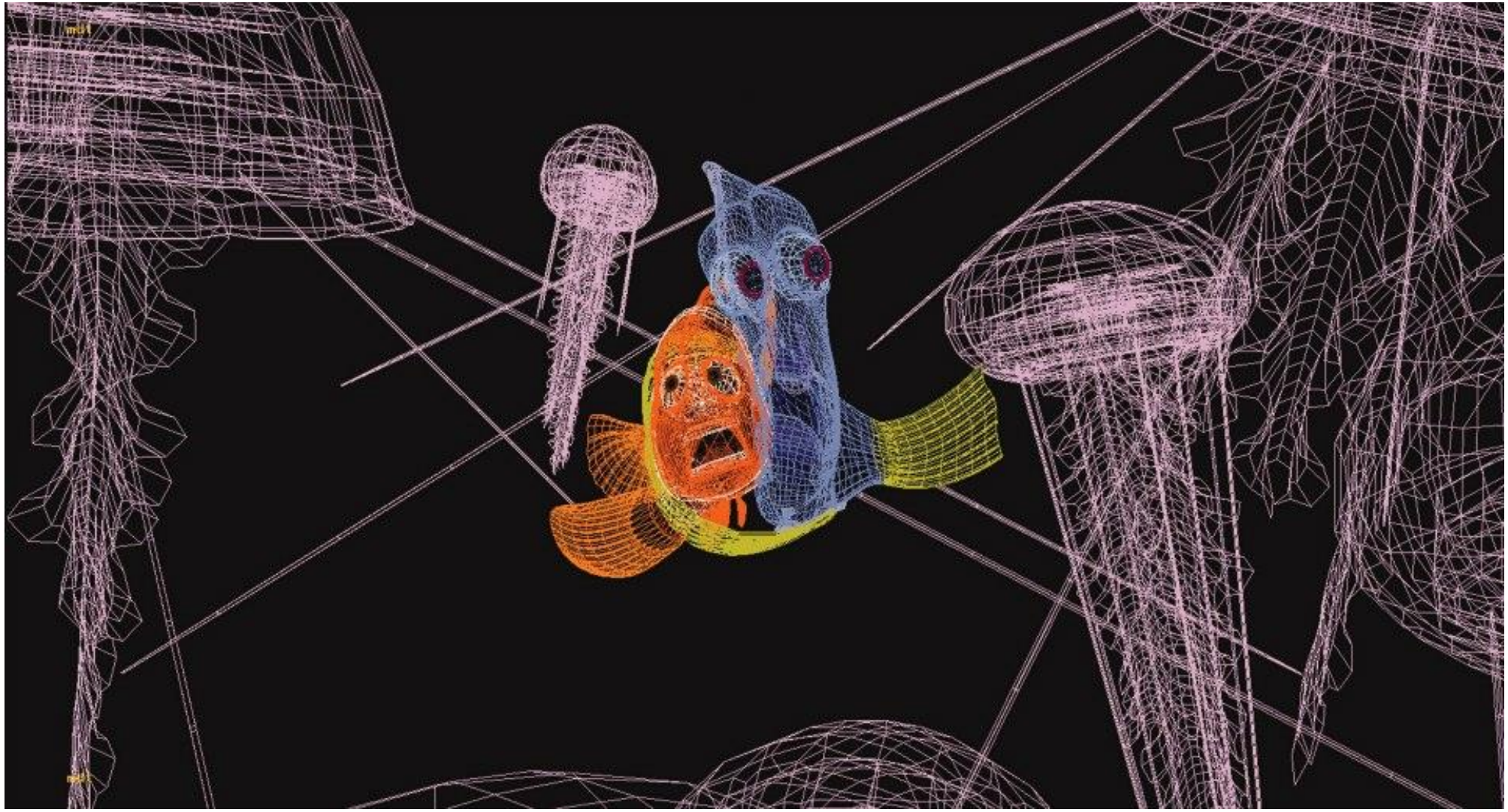
12 Principles of Animation

1.Squash and stretch
2.Anticipation
3.Staging
4.Straight-ahead action and pose-to-pose
5.Follow through and overlapping action
6.Slow in and slow out
7.Arcs
8.Secondary action
9.Timing
10.Exaggeration
11.Solid drawing
12.Appeal



Math and Movies (Animation at Pixar) - Numberphile

https://www.youtube.com/watch?v=mX0NB9lyYpU

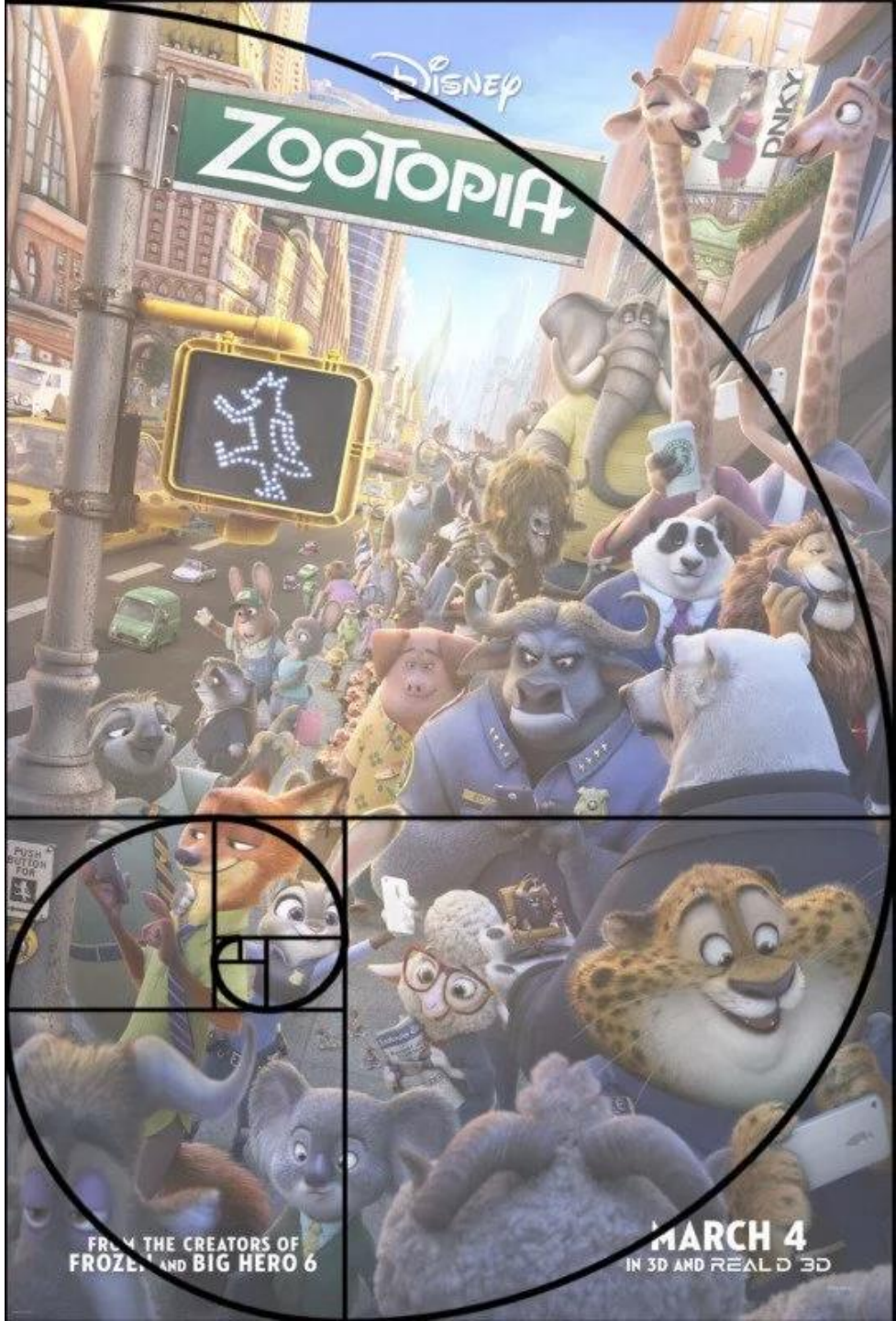


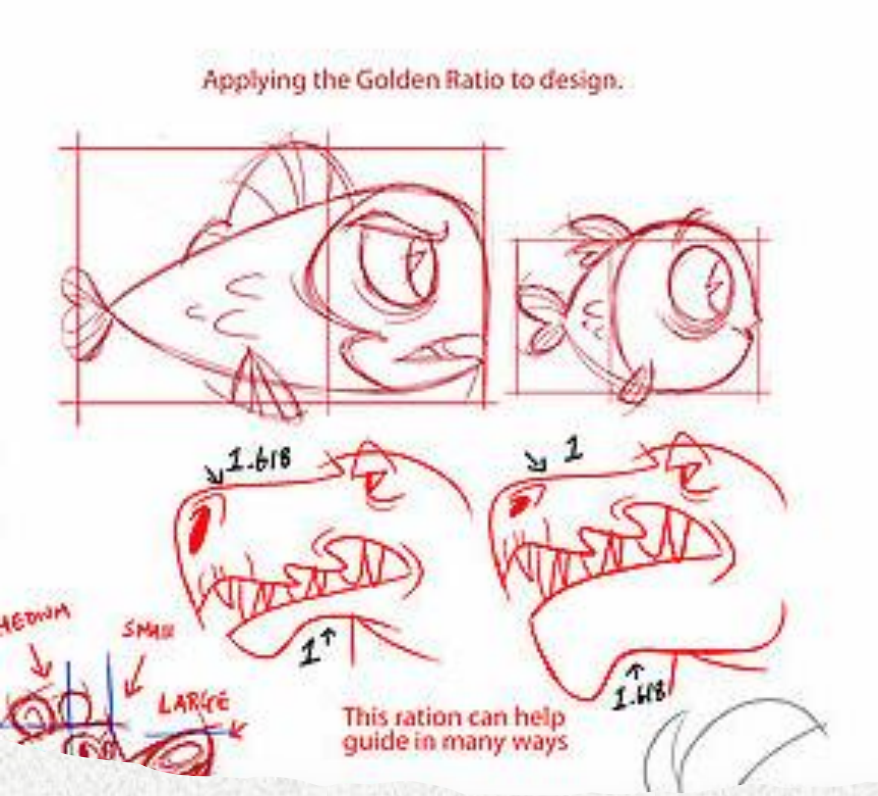
12 Principles of Animation

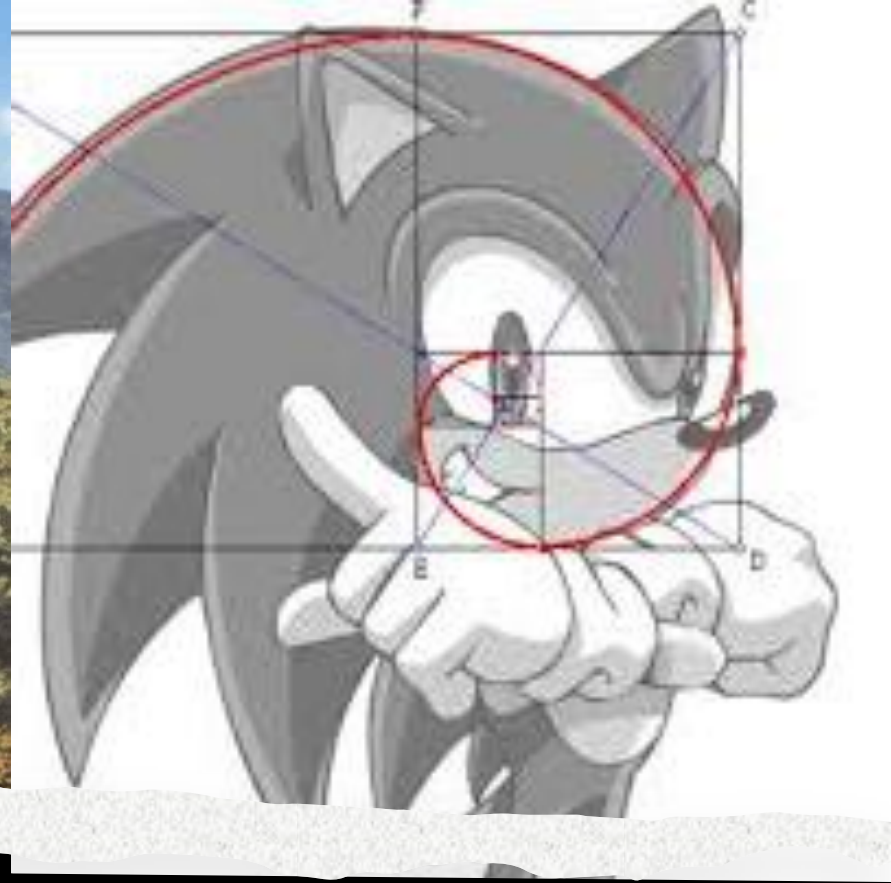
1. Squash and stretch
2. Anticipation
3. **Staging**
4. Straight-ahead action and pose-to-pose
5. Follow through and overlapping action
6. Slow in and slow out
7. Arcs
8. Secondary action
9. Timing
10. Exaggeration
11. Solid drawing
12. **Appeal**

$$\textit{Golden Ratio}$$

$$\varphi = \frac{1+\sqrt{5}}{2}$$







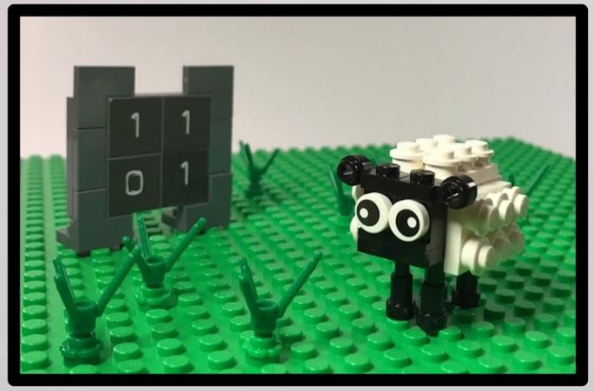
- https://www.goldennumber.net/golden-ratio-cartoon-character-design/

Any ideas?

Brick Maths

https://www.youtube.com/@brick_maths

Maths explained with Lego® and animal puns



Dr Emily Cook
ejcook@swin.edu.au

A/Professor Paul Hernandez Martinez

Swinburne University of Technology

AMSI Industry Day for Teachers
June 18th, 2025

The use of storytelling to support conceptual learning in upper secondary and tertiary mathematics education

Paul Hernandez Martinez
Swinburne University of Technology

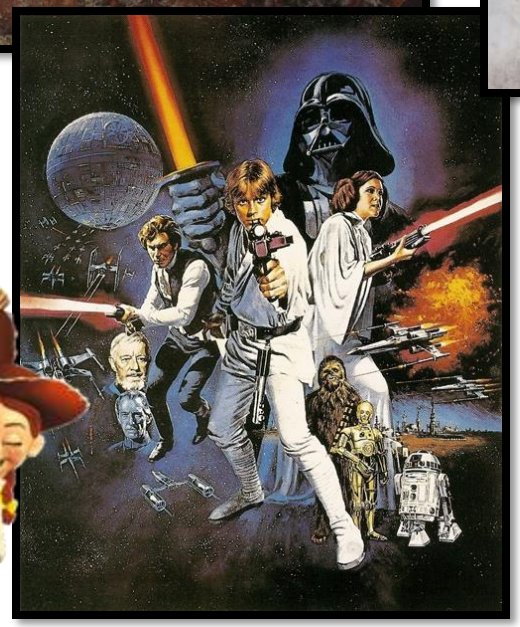
Preparing students for work and citizenship

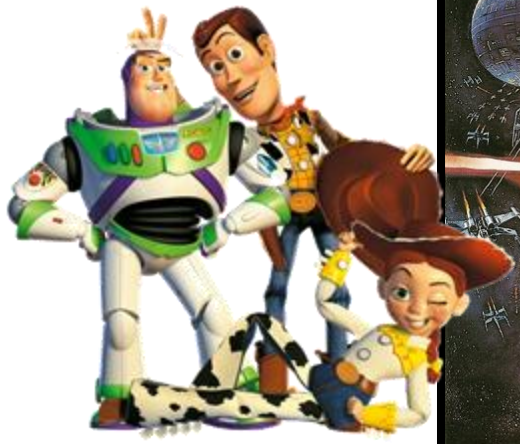
We want our students to develop useful skills.

Amongst these are the skill to effectively communicate complex and abstract ideas, such as mathematical concepts or models, to a wide range of people with different backgrounds and interests.

At the same time, we want students to enjoy and understand mathematics and its value to society. If they can develop rich meanings of the mathematics they are learning, they can build their confidence and be better placed to be creative and contribute to their communities.

Why storytelling?





"[…] we do not achieve our mastery of social reality by growing up as […] 'little mathematicians'", but instead "we organize our experience and our memory of human happenings mainly in the form of narrative – stories, excuses, myths, reasons for doing or not doing, and so on." (Bruner, 1991, p. 4)

Why stories in Mathematics?

- Storytelling allows students to link abstract information to concrete situations, helps humanise the abstract, promoting imagination and creativity (Albano & Pieri, 2017; Cemil, 2015; Clark & Rossiter, 2008), and a strong sense of ownership (Walters et al., 2018).

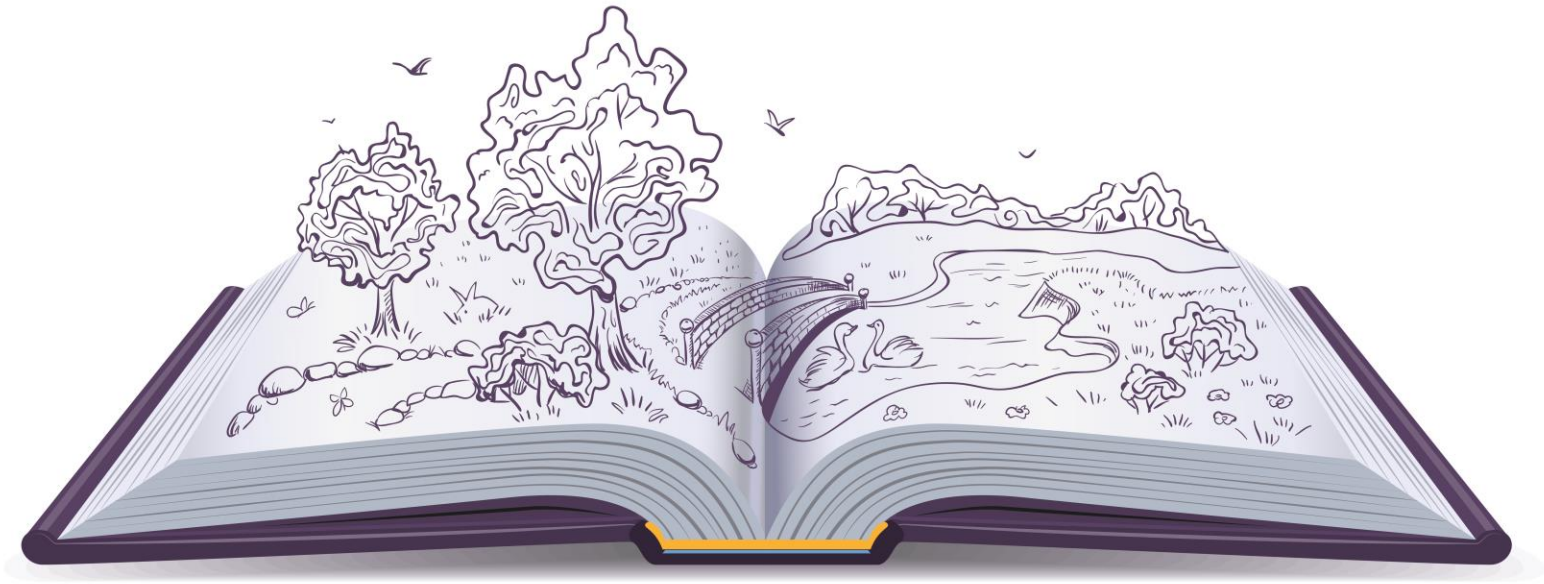
- Storytelling has the potential for motivation and positive attitude change (Hung et al., 2012).

Why stories in Mathematics?

- Storytelling can help students develop important skills, as the person needs to explain and provide meaning to the Mathematics through a story that makes sense not only to them but also to others; stories create a sense of connectedness, relevancy, and coherency (Avraamidou & Osborne, 2009; Marsico et al., 2019; Noll et al., 2018; Bruner, 1987).

What is a story?

Mentimeter



Are these stories?

1. Animation vs. Maths
   https://www.youtube.com/watch?v=B1J6Ou4q8vE
2. Math Antics – Finding a percent of a number
   https://www.youtube.com/watch?v=rR95Cbcjzus
3. The infinite hotel paradox
   https://www.youtube.com/watch?v=Uj3_KqkI9Zo

What makes a good mathematics story?

Mentimeter

What do you think is important in creating a good digital mathematics story, in terms of:

- Storytelling
- Mathematics
- Technology

A working definition of story

A story is a narrative that has:

- a plot, which is a sequence of interrelated events with a beginning, a middle, and an end, with the motive of creating pleasure or pain (Stein, 1982) (i.e., emotions are involved); and
- a character/(s) that lead the development of the plot.

A digital story is a story that uses multimedia (e.g., sound, video, animation, etc.) (Robin, 2008).

Elements of good stories

- Discernible plot
- Conflict – resolution of conflict
- Imagery
- Human meaning
- Wonder
- Humour

(Zazkis & Liljedahl, 2009)

- The use of archetypes as patterns of culture in the "collective consciousness" (Mayes, 2020; Nelson, 2009)

https://youtu.be/_AXTEjesFPs

Some tools for creating digital stories

Royalty-free pictures
https://www.pexels.com
https://thenounproject.com
https://www.freepik.com
https://pixabay.com

Voices/Subtitles
https://elevenlabs.io
https://www.narakeet.com
Adobe Firefly

Sound effects
https://pixabay.com

AI
https://chatgpt.com
Adobe Firefly

Video production/editing
CreateStudio3
MS Powerpoint
Camtasia
Adobe Express, Firefly, Photoshop, Premier Pro
DaVinci Resolve
Clipchamp

Courses
https://www.udemy.com

Other
https://mathstory.org

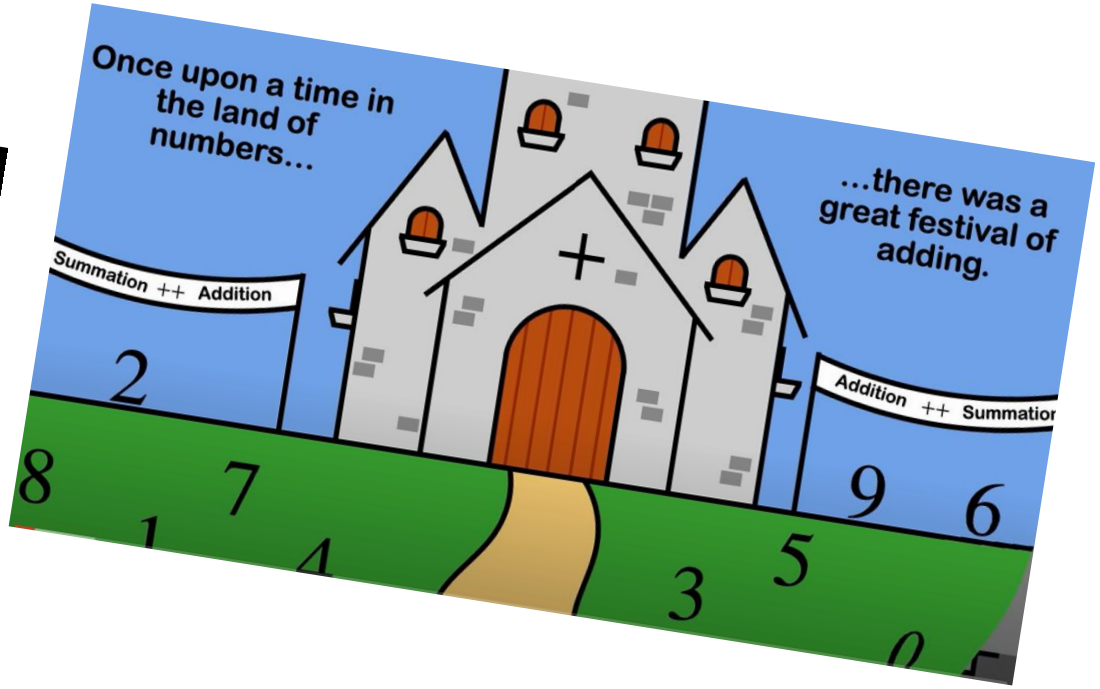
Two examples of Mathstories

1. Fractions – a love story

   https://youtu.be/swwIbgvomok?si=u0b-pQdOu2jxkyBA

2. The (pi)zza problem

   https://youtu.be/LITJ121QKo4?si=AwpONbU-De0wW3Kh



Three examples of a mathstory on function

I want to hear if you are using storytelling in your teaching/research, so keep in touch.

phernandezmartinez@swin.edu.au

Subscribe to my YouTube channel

Youtube.com/@mathstorytelling

Ms Leanne McMahon

AMSI

Careers Resources in Maths

(There's so much more than you think!)

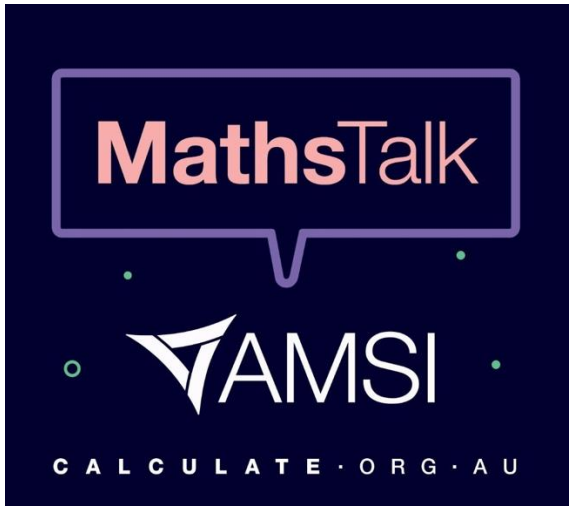
AMSI Industry Day for Teachers
Tuesday 13th May 2025

leanne@amsi.org.au

CHOOSEMATHS

Introductions

The **Australian Mathematical Sciences Institute (AMSI)** is Australia's national voice and champion for mathematics and statistics. A not-for-profit, the Institute works with schools, universities, industry, government and the community to help shape policy and skill Australia for the future.



Learning Maths v Doing Maths

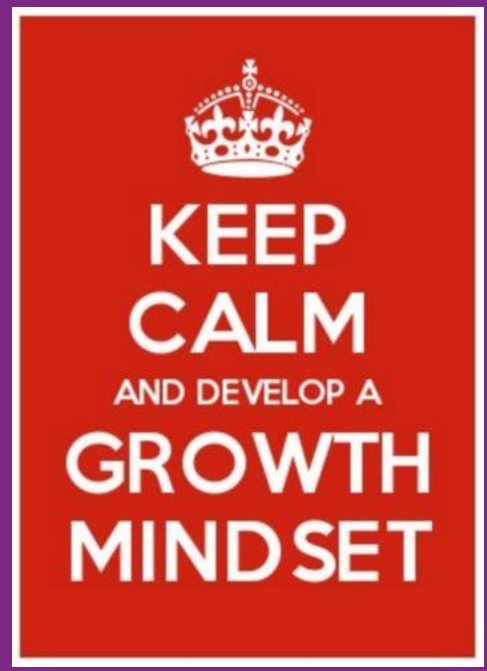
AMSI CAREERS

- https://careers.amsi.org.au/
- https://ss.amsi.org.au/careers-day/
- https://careers.amsi.org.au/all-videos/
- Careers-based Lessons: https://amsi.org.au/2024-teacher-professional-learning-in-industry-day/

Maths Anxiety: Overcoming the elephant in the classroom for FULL career participation

AMSI Industry Day for Teachers
Wednesday 18th June 2025

Leanne McMahon Leanne@amsi.org.au



CHOOSEMATHS

Session Highlights

1. The importance of confidence/ self-efficacy
2. What causes Maths Anxiety?
3. What can we do?

Why?

"Self-confidence and/or self-concept is by far the most oft-cited explanation for the STEM gender gap." (Kanny et al., 2014)

Confidence is the "single most important predictor of math accuracy" (Morony et al., 2013)

Self-efficacy v Confidence

Self-efficacy is the belief we have in our own abilities, specifically our ability to meet the challenges ahead of us and complete a task successfully (Akhtar, 2008) Perceived self-efficacy refers to an individual's belief in their capacity to act and achieve specific levels of performance or outcomes.

Confidence is a more general term that denotes the strength of one's belief, but it does not necessarily specify the focus of that belief.

Where does self-efficacy start?

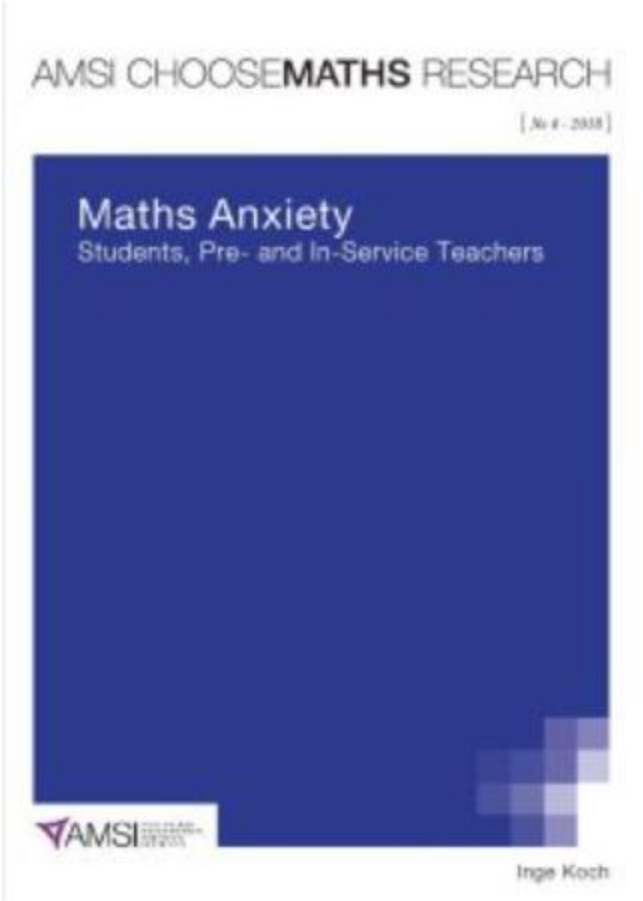
Achievement in early years determines interest and confidence

Causes of low self-efficacy

Most popular possibilities

- Family influences and expectations
- Structural barriers including teachers, schools, curriculum, class structure, peers.
- Out of Field teachers (including primary teachers)
- Maths Anxiety in teachers
- Psychological factors in students; values, preferences, mental health, Maths anxiety.
- Perceptions of STEM fields (blokey, nerdy, difficult, boring) so “I don’t belong”

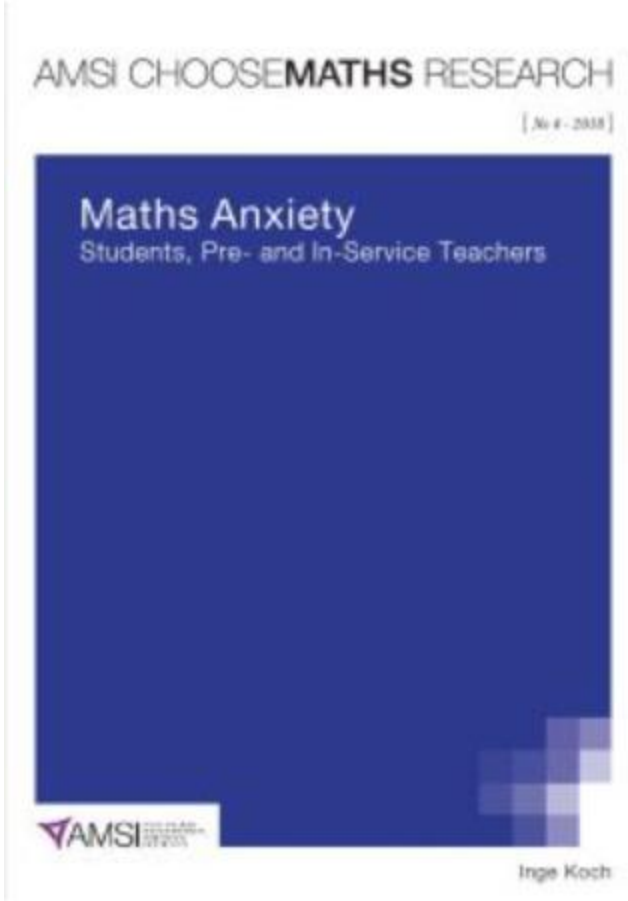
Maths Anxiety in teachers: Maths taught in fear is Maths half taught



MA manifests as a fear of performing mathematical tasks, teaching mathematical concepts and even discussing these concepts with other staff members.

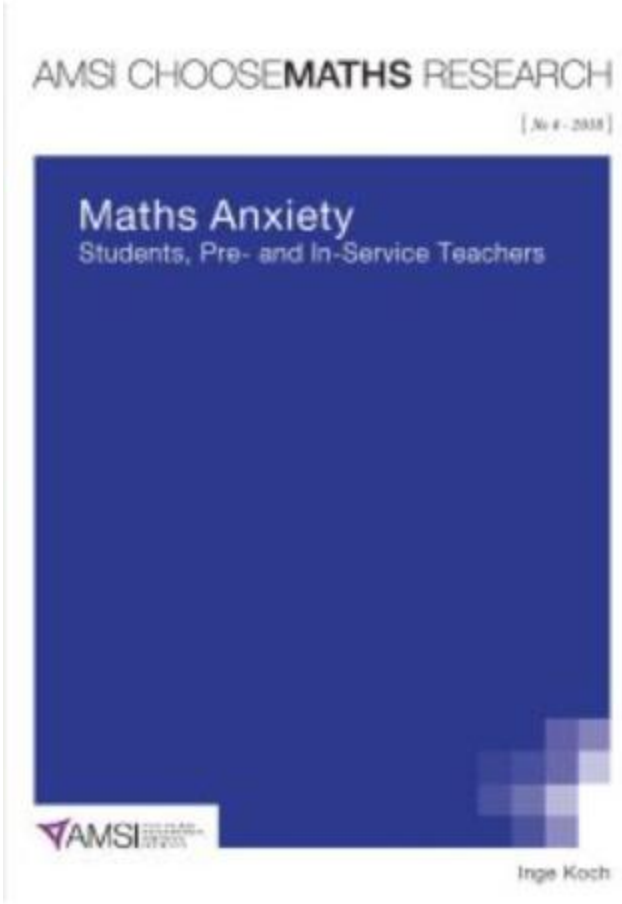
https://schools.amsi.org.au/2019/01/14/choosemaths-days-2018-report-3/

Maths Anxiety in teachers



- Teachers are one of the most influential factors impacting on student achievements
- Higher levels of maths anxiety in teachers are related to lower mathematics achievements of their students
- Teachers with more knowledge of mathematics are more confident and less anxious in their teaching practices and better able to encourage mathematical learning
- Pre-service teachers require solid knowledge of mathematics, good teaching practices and methods for reducing maths anxiety

Maths Anxiety in Students:



- Maths anxiety affects brain activity, and results in a 'performance deficit' which can lead to achievements below actual abilities
- Girls are more maths anxious and less confident in their mathematical ability than boys although there is no evidence of a gender difference in mathematical ability
- Maths anxiety in 15-year old students has increased from 2003 to 2012 among all students and the gender gap has widened over time
- Environmental non-genetic factors contribute more to the development of maths anxiety than genetic risk factors

Classroom practices that contribute to Maths Anxiety in students

- Failure to ensure that assumed knowledge is actually present.
- Incomplete or poor explanations.
- Failure to provide adequate context.
- The insistence of completing large amounts of activities/content in a short time.
- An emphasis on single procedural skills and correct answers.
- An emphasis on memory
- Timed and high stakes assessments.
- Forcing students to answer questions in front of the class or competitive practices.

(Chernoff & Stone 2014; Karunakaran, 2020)

3. What can we do?

Growth mindset – *The belief that intelligence and talent can be improved with practice, dedication and hard work. (Dweck)*

- Students who view their cognitive abilities as fixed from birth or unchangeable are more likely to experience decreased confidence and performance when faced with difficulties or setbacks.
- There is no such thing as a maths brain, praise the effort not the ability
- Encourage mistakes and embrace errors – safe environment to ask questions. (common misconceptions)

Test your Mindset

Subtracting 2-Digit from 2-Digit Numbers (A)

Name: _____ Date: _____ Score: _____

Calculate each difference.

60 − 29	23 − 10	72 − 21	15 − 10	19 − 18	94 − 19	84 − 22
42 − 38	56 − 54	28 − 26	78 − 43	87 − 62	93 − 17	83 − 47
98 − 89	58 − 10	52 − 45	12 − 11	61 − 26	41 − 24	26 − 11
82 − 82	28 − 19	44 − 20	31 − 20	91 − 88	35 − 24	20 − 13
49 − 25	28 − 28	75 − 43	67 − 31	49 − 49	60 − 34	45 − 35
67 − 58	30 − 29	41 − 18	33 − 21	49 − 27	37 − 13	69 − 15
62 − 54	59 − 34	60 − 19	66 − 48	17 − 13	36 − 15	69 − 23

Math-Drills.com

$$84 - 68 = \square$$

What can we do?

- **Time** for thinking, mulling, reflecting.
- Collaboration > competition
- Playing games can increase interest, but not necessarily understanding. Good teachers will link to learning.

Careers Events

What can we do?

- Scholarships and support (AMSI Yuille-Umbers Female High School Scholarships – Victoria)

Scholarship benefits and opportunities:

- Materials and resources required to study specialist maths.
- Mentorship and guidance from leading mathematics experts.
- Participate in AMSI programs and events.
- Network with female university maths students.
- Network with female maths graduates in amazing jobs.

Key Scholarship Selection Criteria:

- Female students who complete year 10 in 2024, who;
- Intend to study specialist maths in year 11 in 2025 and year 12 in 2026.
- Are studying at an eligible registered Victorian high school (ICSEA score ≤ 46 refer to myschool website)
- Is experiencing and can evidence disadvantage.
- Can provide evidence of strong performance in mathematics.
- Demonstrates a passion for and achievement in mathematics.

Information and application

Developing strategies to enhance self-efficacy and decrease Maths anxiety will lead to a greater number of confident and capable students pursuing and excelling at mathematics at the tertiary level and therefore allow them to participate in exciting, secure and lucrative careers.

Q&A Panel with Federico, Emily, Paul and Leanne

UPCOMING AMSI INITIATIVES

- Yuille-Umbers Scholarship Aug-Sep
- AMSI-Telstra Online Career Webinar July
- Post-event survey (CSIRO)
- Let us know if you want to be on the podcast!

THANK YOU

- The Invergowrie Foundation
- Swinburne University of Technology
- AMSI Team
- Speakers
- Texas Instruments
- Teachers
- Career Practitioners
- All others!

Mystery Prize Draw