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1 Introduction to Quarto

You can run python code. This will be discussed more in the (Section 1.3)

Here is an example of a citation (Sharma et al. 2018)

1.1 Equations

This is an example of an inline math LaTex equation $f(x) = x^2$

This is an example of an display math LaTex equation

$$f(x) = x^2 + 1$$

Black-Scholes (Equation 1) is a mathematical model that seeks to explain the behavior of financial derivatives, most commonly options:

$$\frac{\partial \mathrm{C}}{\partial \mathrm{t}} + \frac{1}{2}\sigma^2 \mathrm{S}^2 \frac{\partial^2 \mathrm{C}}{\partial \mathrm{C}^2} + \mathrm{rS}\frac{\partial \mathrm{C}}{\partial \mathrm{S}} \ = \mathrm{rC} \tag{1}$$

Wave equation (Equation 2) is a mathematical model that seeks to explain the behavior of financial derivatives, most commonly options:

$$\frac{\partial^2 u}{\partial t^2} = c^2 \left(\frac{\partial^2 u}{\partial x_1^2} + \frac{\partial^2 u}{\partial x_2^2} + \cdots + \frac{\partial^2 u}{\partial x_n^2} \right) \tag{2}$$

Multi-line equation (Equation 3)

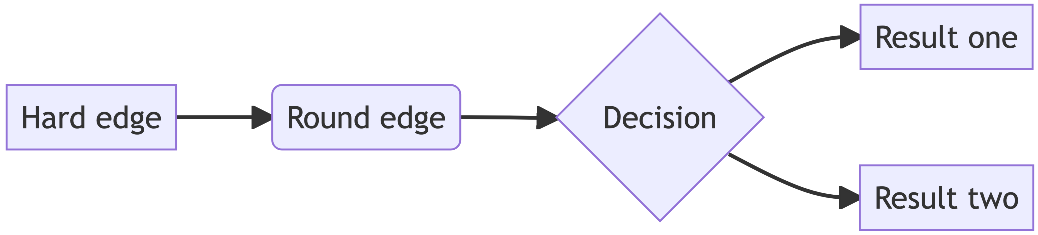
$$\begin{aligned} A &= \frac{\pi r^2}{2} \\ &= \frac{1}{2}\pi r^2 \end{aligned} \tag{3}$$

1.2 Flow-charts

Quarto has native support for embedding Mermaid and Graphviz diagrams.

This enables you to create flowcharts, sequence diagrams, state diagrams, gnatt charts, and more using a plain text syntax inspired by markdown.

For example, here we embed a flowchart created using Mermaid:



1.3 Code

In this section we show how to demonstate, caption, and reference figures (both generated with code and externally loaded)

In (Figure 1) we show a plot showing decaying oscillations

Here is another example of a citation (Hickman and Mishin 2016)

In (Figure 2) we show a plot showing decaying oscillations

1.4 References

Hickman, J, and Y Mishin. 2016. "Temperature Fluctuations in Canonical Systems: Insights from Molecular Dynamics Simulations." *Physical Review B* 94 (18): 184311.

Sharma, A, J Hickman, N Gazit, E Rabkin, and Y Mishin. 2018. "Nickel Nanoparticles Set a New Record of Strength." *Nature Communications* 9 (1): 1–9.

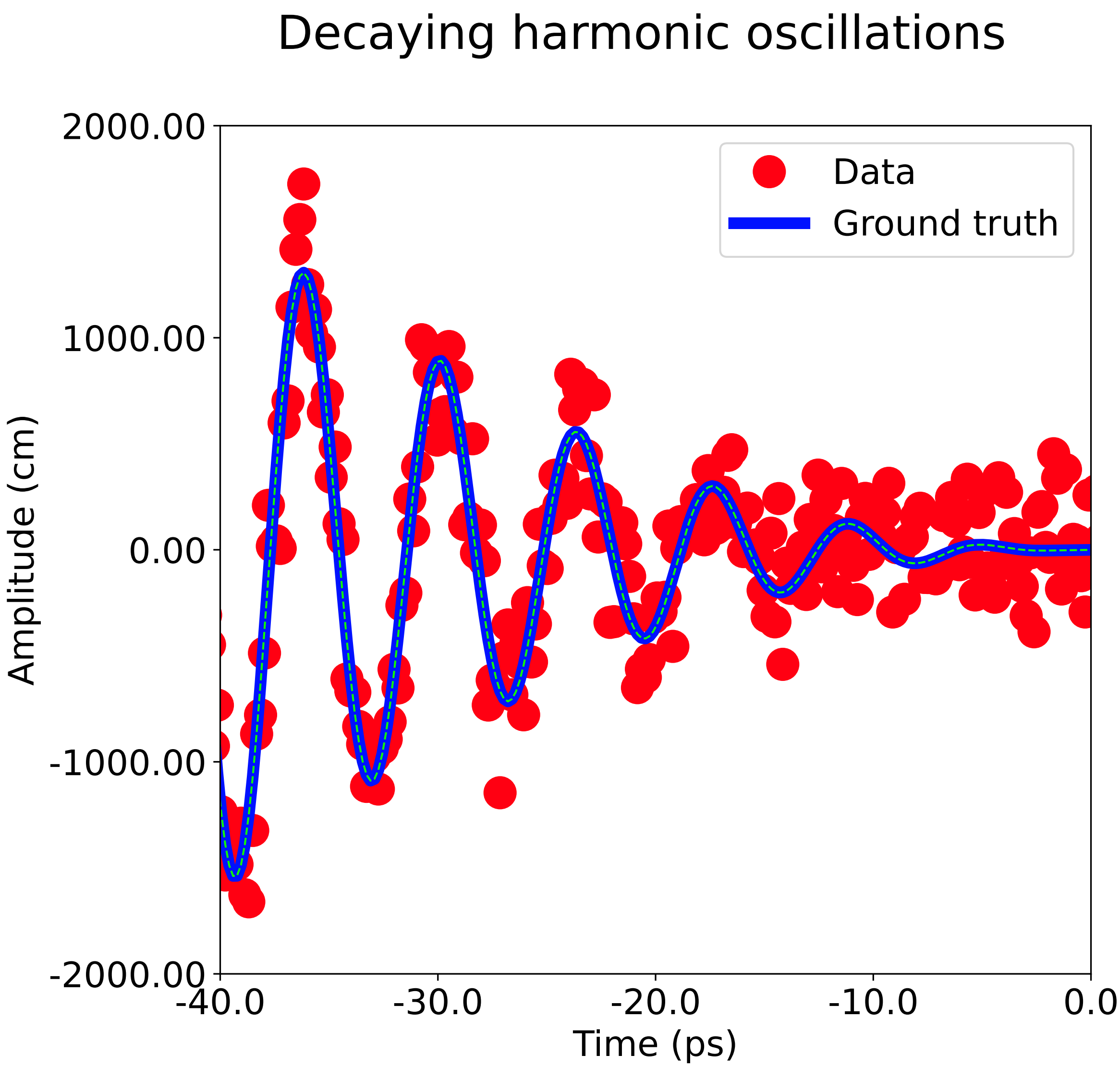


Figure 1: A plot showing decaying oscillations

Parameters and Function transformations

Transformation Rules for Functions		
Function Notation	**Type of Transformation**	**Change to Coordinate Point**
f(x) + d	Vertical translation up d units	(x, y) → (x, y + d)
f(x) − d	Vertical translation down d units	(x, y) → (x, y − d)
f(x + c)	Horizontal translation left c units	(x, y) → (x − c, y)
f(x − c)	Horizontal translation right c units	(x, y) → (x + c, y)
−f(x)	Reflection over x-axis	(x, y) → (x, −y)
f(−x)	Reflection over y-axis	(x, y) → (−x, y)
af(x)	Vertical stretch for |a|> 1 Vertical compression for 0 < |a| < 1	(x, y) → (x, ay)
f(bx)	Horizontal compression for |b| > 1 Horizontal stretch for 0 < |b| < 1	$(x, y) \rightarrow \left(\frac{x}{b}, y\right)$

Rigid

Non-Rigid

https://www.onlinemathlearning.com/parent-functions.html

$\boxed{\text{MODEL} = \text{Functional form} + \text{Parameterization}}$

(underlying shape) (stretching and shifting)

$y = f(x) \rightarrow$ **"parent function"**

Example: $f(x) = e^{-x^2}$

$$y = f(x\,|\,\mathbf{p}) = A \cdot \exp^{-\left(\frac{x - x_o}{w}\right)^2} + S$$

$$x_i \rightarrow \tilde{x}_i = \frac{x_i - \mu_x}{\sigma_x}$$

$$y = f(x\,|\,\mathbf{p}) = A f\left(\frac{x - x_o}{w}\right) + S$$

$\mathbf{p} = (A, x_o, w, S)$

$A =$ **verticle stretch (amplitude)**

$x_o =$ **horizontal shift (recentering parameter)**

$w =$ **horizontal stretch (width parameter)**

$S =$ **verticle shift (shift parameter)**

Alternative form: $y = f(x\,|\,\mathbf{p}) = A f(w_1 x + b) + S$

(weights and bias) $w_1 = \frac{1}{w}$ **and** $b = -\frac{x_o}{w}$

Figure 2: An example of another figure