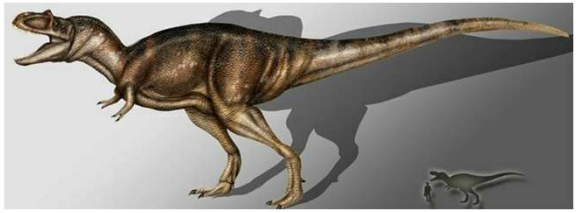
Ice-breaker Session (Answers for the “Distributions” Game; total number of points 41)

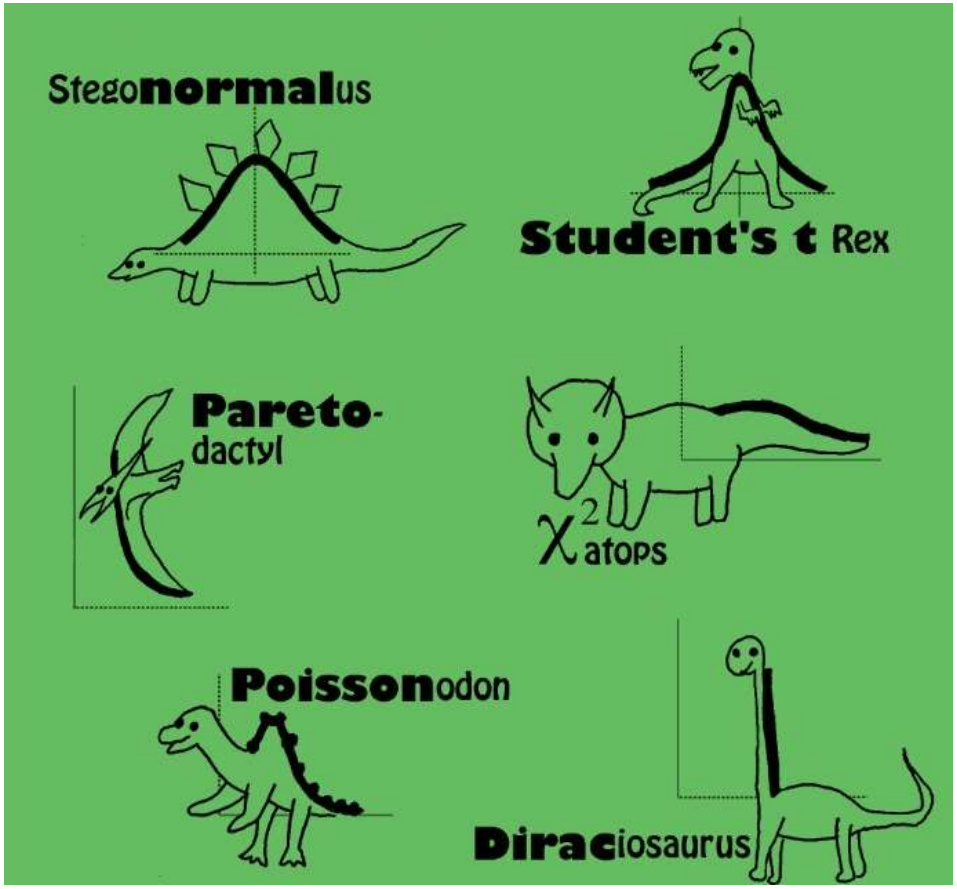
EFPSI Stats Leaders Meeting, May 2023

Q1: Match the names with the dinosaurs.

Velociraptor

Albertosaurus



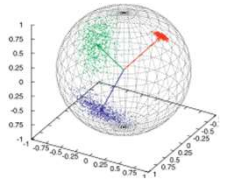


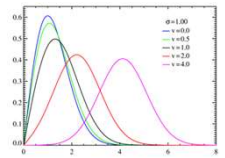
Design by Tamara Broderick.

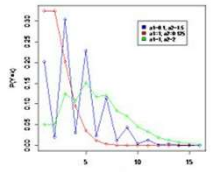
Total number of points for Q1: 6

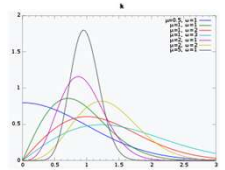
Q2: Find the fake distribution names.

- **Kent distribution:** In directional statistics, the Kent distribution, also known as the 5-parameter Fisher–Bingham distribution (named after John T. Kent, Ronald Fisher, and Christopher Bingham), is a probability distribution on the unit sphere. On two dimensional sphere, is the analogue of the bivariate normal distribution with an unconstrained covariance matrix. The Kent distribution was proposed by John T. Kent in 1982, and is used in geology as well as bioinformatics.
- **Rice distribution**: It is the probability distribution of the magnitude of a circularly-symmetric* bivariate normal random variable with potentially non-zero mean. It was named after Stephen O. Rice (1907–1986).
- **Hermite distribution:** Named after Charles Hermite, it is a discrete probability distribution used to model count data with more than one parameter. It allows to model a moderate over-dispersion in the data.
- **Nakagami distribution:** It is related to the Gamma distribution and was first proposed in a 1960 article by Minoru Nakagami as a mathematical model for small-scale fading in long-distance high-frequency radio wave propagation.







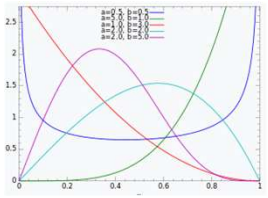


* For a scalar complex random variable, circular symmetry means that its real and imaginary parts are independent and have the same distribution.

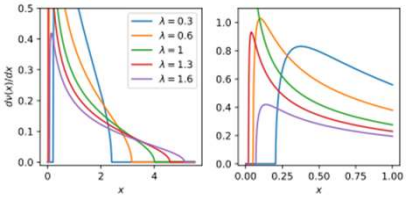
Total number of points for Q2: 5

Q2: Find the fake distribution names.

- **Kagoshima:** That's a city in Japan!
- **Kohlrabi:** That's a vegetable!
- **Kumaraswomy:** This means nothing! It is actually the KumaraswAmy distribution which is a family of continuous probability distributions defined on the interval (0,1). It is similar to the Beta distribution, but much simpler to use especially in simulation studies since its probability density function, cumulative distribution function and quantile functions can be expressed in closed form. It was originally proposed by Poondi Kumaraswamy for variables that are lower and upper bounded with a zero-inflation.



- **Sakamoto:** Sakamoto is just a Japanese surname.
- **Marchenko–Pastur distribution:** It describes the asymptotic behaviour of singular values of large rectangular random matrices. It is named after Soviet mathematicians Vladimir Marchenko and Leonid Pastur who proved it in 1967.

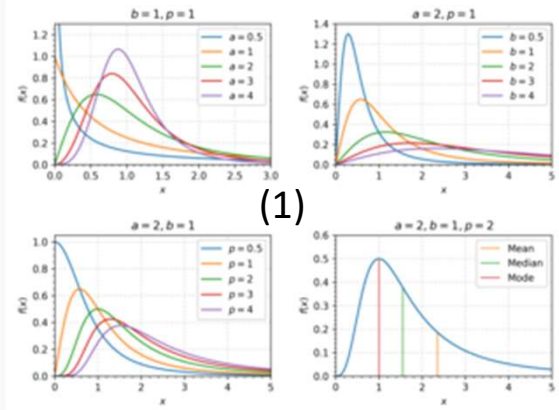


- **Champernowne distribution:** It is a symmetric, continuous probability distribution, describing random variables that take both positive and negative values. It is a generalization of the logistic distribution and was used to describe the distribution of the logarithm of income. It is named after David Gawen Champernowne.

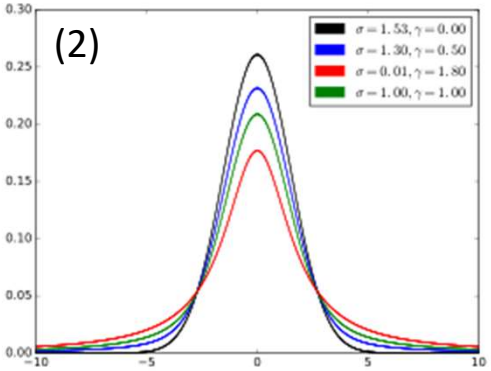
Total number of points for Q2: 5

Q2: Find the fake distribution names.

- **Dagum distribution:** It is a continuous probability distribution defined over positive real numbers. It is named after Camilo Dagum, who proposed it in a series of papers in the 1970s to study the distribution of income. (1)
- **Voigt distribution:** The Voigt profile (named after Woldemar Voigt) is a probability distribution given by a convolution of a Cauchy-Lorentz distribution and a Gaussian distribution. It is often used in analysing data from spectroscopy or diffraction. (2)
- **Wasabi:** Wasabi or Japanese horseradish is a plant. (3)



(1)



Total number of points for Q2: 5

Q3: Match the distributions with the name and date of their discovery.

Jacob Bernoulli	Thomas Bayes	Carl Friedrich Gauss	Benjamin Gompertz	Simeon Denis Poisson	James Clerk Maxwell	Ernst Karl Abbe*	Francis Galton & Donald McAlister	William Searly Gosset	Waloddi Weibull
Binomial	Beta	Normal	Gompertz	Poisson	Maxwell-Boltzmann	Chi-squared	Log-normal	Student's t	Weibull
1713	1763	1809	1825	1837	1859	1863	1879	1908	1939

*According to Sheynin (1977), the chi-square distribution was discovered by Ernst Karl Abbe in 1863,

Total number of points for Q3: 20

Q4: Match the distributions with the correct kurtosis term.

The standard measure of a distribution's kurtosis (excess kurtosis; from Greek “kurtos” or “κυρτός” means “curved”), originating with Karl Pearson, is a scaled version of the fourth moment of the distribution.

Mesokurtic distributions have zero excess kurtosis; from Greek “meso-” or “μέσος” means “in the middle”. **Leptokurtic** distributions have positive excess kurtosis, i.e. fatter tails; from Greek “lepto-" or “λεπτό” means “thin". **Platykurtic** distributions have negative excess kurtosis, i.e. thinner tails; from Greek “platy-“ or “πλατύ” means “wide".

Mesokurtic : Normal, Binomial (p=1/2)

Platykurtic: Uniform, Bernoulli (p=1/2)

Leptokurtic: Student’s t, Rayleigh, Laplace, Exponential, Poisson, Logistic

Total number of points for Q4: 10

Congratulations!