1 Introduction

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1.1 More detail

The simplest case of a normal distribution is known as the standard normal distribution or unit normal distribution. This is a special case when $\mu =$ and $\sigma = 1$, and it is described by this probability density function:

$$\varphi(x) = \frac{e^{-\frac{x^2}{2}}}{\sqrt{2\pi}}\,.$$

The cumulative distribution function (CDF) of the standard normal distribution, usually denoted with the capital Greek letter Φ, is the integral

$$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-t^2/2}\,dt\,.$$

1.2 La ley del revólver

En 1955 fue elegido, ayudado por su gran porte y por su ideología republicana, para interpretar al Márshal Matt Dillon en la serie *La ley del revólver* (*Gunsmoke*). En un primer momento los productores de la cadena televisiva CBS pensaron en contratar a John Wayne, pero la idea finalmente no prosperó. La serie se emitió por primera vez en el año 1955, y acompañaban a James Arness los actores Dennis Weaver, como el ayudante Chester Goode; Milburn Stone, como el Doctor; y Amanda Blake, como Kitty. Por la serie pasaron como invitados grandes actores de la talla de John Wayne, presentando el primer capítulo, Bruce Dern, Bette Davis, Warren Oates, Chuck Connors, Charles Bronson, John Carradine, David Carradine, George Kennedy, William Shatner,

[1] Peter Graves, de son vrai nom Peter Duesler Aurness, est un acteur et réalisateur américain, né le 18 mars 1926 à Minneapolis dans le Minnesota (États-Unis), et mort le 14 mars 2010 à Pacific Palisades, à Los Angeles, en Californie (États-Unis). Il est surtout connu pour son rôle dans la série Mission Impossible.

Leslie Nielsen, Adam West, y muchos más. En la serie trabajó Burt Reynolds, como Quint Asper, el herrero del pueblo. La serie se emitió entre 1955 y 1975 y en 1987 se filmó la película *Gunsmoke: Return to Dodge*, seguida de *Gunsmoke II: The Last Apache* (1990), *Gunsmoke III: To The Last Man* (1992), *Gunsmoke IV: The Long Ride* y *Gunsmoke V: One Man's Justice*, de 1993, las dos últimas secuelas de la serie.

2 Another Section

As hinted in section 1, the binary entropy function can be bounded in terms of the factorial choose function (e.g., [1, lemma 2.3.5, p. 33]). To begin, for integers k and n, with $k \leq n$, we recall the basic definition

$$\binom{n}{k} = \frac{n!}{k!\,(n-k)!}\,,$$

and the binomial expansion

$$(x+y)^M = \sum_{i=0}^{M} \binom{M}{i} x^i\, y^{M-i}.$$

With δ lying between 0 and 1, we may set $x = \delta$ and $y = 1-\delta$ to obtain

$$1 = \sum_{i=0}^{M} \binom{M}{i} \delta^i\,(1-\delta)^{M-i}.$$

We denote the binary entropy function as

$$H_2(\delta) = -\delta \log_2 \delta - (1-\delta)\log_2(1-\delta).$$

We then have, for $0 < \delta \leq \frac{1}{2}$, the inequality

$$\sum_{i \leq \delta M} \binom{M}{i} \leq 2^{MH_2(\delta)}. \tag{1}$$

To verify, we note that

$$2^{-MH_2(\delta)} = \delta^{\delta M}(1-\delta)^{(1-\delta)M}.$$

Now, for $0 < \delta < \frac{1}{2}$, the form $\delta^k\,(1-\delta)^{M-k}$ increases as k decreases. As such, for all $i \leq \delta M$, we have

$$\delta^{\delta M}\,(1-\delta)^{(1-\delta)M} \leq \delta^i\,(1-\delta)^{M-i}.$$

This gives the chain of inequalities

$$\begin{aligned}
1 &= \sum_{i=0}^{M} \binom{M}{i} \delta^i\,(1-\delta)^{M-i} \\
&\geq \sum_{i \leq \delta M} \binom{M}{i} \delta^i\,(1-\delta)^{M-i} \\
&\geq \delta^{\delta M}(1-\delta)^{(1-\delta)M} \sum_{i \leq \delta M} \binom{M}{i} \\
&= 2^{-MH_2(\delta)} \sum_{i \leq \delta M} \binom{M}{i},
\end{aligned}$$

thus confirming the claimed inequality (1). ◇

Apples	per unit	$1.89
Pears	per pound	$1.99
Bananas	per bunch	$1.57
Dunces	per unit	Free

Table 1: Prices of common commodities.

3 Broader Impacts

Scientific progress comes in all shapes and sizes. Researchers peer at the microscopic gears of genomes, scan the heavens for clues of our origins. They unearth wind-weathered fossils, labor over complex circuitry, guide students through the maze of learning. Disparate fields, researchers and methods united by one thing: potential. Every NSF grant has the potential to not only advance knowledge, but benefit society—what we call broader impacts. Just like the kaleidoscopic nature of science, broader impacts come in many forms. No matter the method, however, broader impacts ensure all NSF-funded science works to better our world.

As noted in the Proposal and Award Policies and Procedures Guide (section II.C.2.d), "*Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to the achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the U.S.; use of science and technology to inform public policy; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Proposers may include appropriate outcomes not covered by these examples.*"

4 Intellectual Merit

The control of light propagation by 3D-microstructured optical fibers and temporal index modulation offers novel opportunities to substantially modify the confinement, guiding, dispersive, and nonlinear properties of spaghetti strands. Spaghetti strands have been the backbone of much scientific and technological advancement in recent decades. Many novel ideas in gastonomics as well as in other fields of science can best be explored in the robust platform of spaghetti fibers due to their controllable transverse confinement and low-loss propagation of light. The proposed novel microstructured spaghetti fibers will expand the horizons for such novel explorations. Multimode pasta provides a rather interesting and complex system where the interactions between the nonlinearity, mode-coupling, and microstructured index profiles are largely unexplored and will be fused with organic Marinara sauce.

The project likewise advances meetings and collaborative science by developing "In Person" technology that actually allows people to see and hear each other without using a Zoom connection: it instead leverages Photon Transfer Protocol for video, and Acoustic Molecular Diffusion for audio. With this technology, the video rarely if ever freezes up, and audio dropouts are nearly eliminated, giving an experience almost as authentic as High Definition Virtual Reality. Table 1 documents the economic impact of this technology.

And avoid links like Data.gov or en.wikipedia.org in your text, for good measure. (Depending on your pdf viewer, the latter may function as a hyperlink; the former should not.)

5 Results of Prior NSF Support

The PI's previous awards have led, directly or indirectly, to extreme high-impact events whose monetary figure is incalculable. These include the Loma Prieta earthquake of October 1989, the Katrina hurricane of August 2005, and the six-hour Facebook outage of October 2021.

6 Conclusions

Canada once had a Rhinoceros Party that consistently offered tantalizing election promises that spiced up the discourse. These included: providing higher education by building taller schools; instituting English, French and illiteracy as Canada's three official languages; ending crime by abolishing all laws; and adopting the British system of driving on the left, but phasing it in gradually with only buses driving on the left to begin with. In the 1970s the Rhinos offered a package of corruption and incompetence, and claimed that the then ruling Liberal Party stole their party platform.[2]

References

[1] R. M. Gray, *Entropy and Information Theory*, Springer, New York, 1990.

[2] economist-dot-com/letters/2021/10/09/letters-to-the-editor