VARIOUS THOUGHTS ON COMPUTER SCIENCE

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Abstract

We discuss machine learning and its application to security, microchips and present a testable mathematical hypothesis on how the brain stores memories. In particular we present prototypes for next generation processors and RAM memories.
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Classification: 68Txx, 62P30

1. Introduction

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Data Sharing. Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

1.1. Consider a microchip. It consists of resistors connecting circuits and is made of silicon. Mathematically one can model it as consisting of a number of path from $A$ to $B$. These can be thought of as an entry source and an exit source of electricity. The complexity of the microchip if by complexity we mean e.g the number of circuits it consists of depends on the size of the manufacturers tools and of the possibility of nanoengineering with silicon.

Since each resistor connects a part of a higher voltage with a part of lower voltage, it can be manipulated remotely with a laser set on high frequency e.g in the microwave spectrum. Doing so turns on or off a circuit in the microchip. Doing so in its turn manipulates a component $X'$ of the machine $X$. For simplicity we will imagine $X$ to be a computer in which an article is written and that $X'$ is the display keyboard. Can we now entirely control the computer? No, because we do not a priori know the machine code of the computer nor the high-level language the computer is using. So what can one do?

Using clustering techniques from machine learning we could identify which part of the chip does what by dividing the chip into regions $I_1, \ldots, I_K$, each consisting of circuits, $l = \bigcup_{i \in I} l_{ij}$ so that each circuit $l_{ij} = y_{ij}$ is highly correlated to each circuit $l'_{i'j'}$ whenever there exists a region indexed by $I_s$ for some $s \in \mathbb{N}$ such that $(i, j), (i', j') \in I_s$. But what do we mean by the word "correlated"?

To deconfuse a little let us imagine without loss of much generality that $X'$ prints out everything in binary. We imagine two different ways of attacking the problem.

\begin{itemize}
  \item [Date: October 2023.]
  \item [1] This is well known by the military and is used to take out enemy apparel. The technology is by the way most likely behind the so called Cuba Syndrome and depending on its power can be harmful against people.
\end{itemize}
1.2. Consider codes \( x_1, \ldots, x_N \in \{0,1\}^n \). Consider a micro-chip \( X \) and let its nodes be \( y_1, \ldots, y_M \). Introduce a total energy functional
\[
E(l, x) = c \sum_{i,j} x_i \oplus y_j
\]
and a joint probability measure
\[
p(l, x) = \frac{1}{C} e^{-E(l, x)}.
\]
Observe that
\[
E(x, x) = E(l, l) = 0
\]
and that the energy increases with the Hamming distance between a code and a given node. This is nothing but the Ising model from machine learning and its solution is classical.

1.3. Let \( n \in \mathbb{N} \) be fixed. Introduce Hamming distance \( d_n : \{0,1\}^n \times \{0,1\}^n \to \mathbb{N} \) between binary codes. If \( \omega \in \{0,1\}^n \) is a word such that there is a function \( a : l \to \{0,1\}^n \) such that there is a word \( x \in l \) such that \( \omega = a_l(x) \) then we say that \( \omega \) is coded from the circuit \( l \). We write \( x \omega \) to indicate that \( \omega \) is coded from \( x \) in the circuit \( l \). Write \( |\cdot| = d_n(\cdot,0^n) \) then Hamming distance induces a metric on circuits
\[
(l, l') = \max_{|\omega|} \min_{x,y} d(x, y)
\]
by for each circuit choosing a maximal Hamming length maximal length word and for each word choosing a minimal length code. The problem of laser hacking is then reduced to the following: for each circuit \( l \) find \( x \) such that
\[
L(x) = (l, \emptyset) - d(x, 0)
\]
is minimal. For simplicity we shall model each code as being simply a linear relationship; in practice a neural network is probably to be preferred. Thus we write
\[
x = \sum a_k \omega_k a_{ks} \in \mathbb{R}
\]
and assuming \( x \in \{0,1\}^n \) one question is then to find \( A = (a_{ks}) \) so that the Hamming distance to \( O^n \) is minimal and such that \( \omega = A^{-1} x \in l \).

The other question is to find in each circuit a word of maximal length containing as much non-zero digits as possible. This is in essence a topological problem because it is simply a matter of finding maximal loops in the circuit. A mathematicians topological problem is the engineers "well let’s have a look" problem so given the possibility to scan electromagnetically the microchip using the laser voltometer this is no issue.

1.4. Using a laser it is well known since the 1990s that one can measure voltage and thus by Ohms law also the power of an electric current remotely. The procedure outlined above would enable one to "laserhack" any device made up of a modern microchip. So therefore we propose solutions to the problem: how to construct a microchip that is faster than anything on the market and which cannot be laserhacked.

1.4.1. Consider a laser \( l \) set on a frequency \( \lambda \) and let \( x_1, \ldots, x_N \) denote microscopically thin glass plates. Strew the glass plates with Magnesium Ioxide in one of two layers \( I \) and \( II \) by using an adherent. Orthogonally to the glass plates and the first laser place a second laser \( l' \) the light of which is diffracted with a lense so to make a plane orthogonal to \( l \). When a photon is emitted by \( l \) it hits the glass plates at times \( t_1, \ldots, t_n \). Connect \( l' \) with a voltometer. Since the photon emits an electron at impact with each glass plate one can measure when each plate is impacted. By the photoelectric effect the two layers will emit and absorb energy differently.
Remark 1. Using instead several layers $I_1, \ldots, I_n$ one can so to say create multi-dimensional microchips with almost infinite complexity.

1.4.2. How to construct a RAM memory which cannot be laserhacked. Take a microscopic cylinder $C$ of ferrite. Using a cohesive strew its inside with silver salt and place a laser $l$ at its center. To store information burn with the laser at a certain amplitude $A$ and to retrieve information connect the laser with a voltmeter and scan at a lower amplitude $A' << A$. The light reacts with the photoelectric silver salt releasing an electron the perturbation of which with the magnetic field before and after burning represents the information.

1.4.3. How to cryptohack. Given a device communicating in a time interval $[0, t_0]$ with another device through wireless port at $A$. Using a radioweapon one could jam it at different times. Since modern wireless communication is transferring bit by bit it can be modelled as $A$ sending words $\{0, 1\}^n$ and thus this single step of jamming replaces a number of bits in the word with zeroes. After a finite amount of time the attacker would be able to duplicate parts of the information and thus performing CCA attacks on the device.

1.4.4. Using a conducting material as for instance iron welded into a demisphere $D$ coated with silver salt and connected to one or several voltmeters, one could construct a "lasersonar". Say that light is emitted by a light source $L$. It reaches the lasersonar and is read off by the voltmeters. In this way one could hope to make a three dimensional model of the object.

1.4.5. Using the technology which we discuss here one could transport energy in a more efficient and faster way than anything used today. Imagine transporting energy from a solarplant in Arizona to North Dakota. One constructs a mast equipped with a radioweapon which boils water in North Dakota thus feeding a turbine giving electricity. In the future this may become more efficient than transporting via highvoltage wires across large distances.

1.4.6. Replacing each components in a wireless transmitter and receiver with a laser and a photovoltaic receiver one could construct an internet many times faster than the current one. Indeed current wireless communication is essentially sending one bit after another. Using a laser, that is, a bundle of photons one could instead of sending one bit at a time send a large number of bits. This solution might even be the natural one if one builds micro-chips as the ones we considered previously.

2. How does the brain store information? Using a laser set at usual frequency and at microwave frequency one can research this problem.

We model the brain as consisting of cells of a "general" type each contained in clusters which in its turn are contained in centre of various kinds as for instance the sight centre. We model that each cell $c$ in a given cluster $\mathcal{C}$ consists mainly of water and is negatively charged with charge $x_c$.

Consider that $\mathcal{C}$ makes part of the sight centre $\mathcal{S}$ and let us assume an image $\mathcal{B} \cup \mathcal{W}$ consisting for simplicity of a circle with a blue and a white half is perceived by the observer. Let us model the visual nerve as a cylinder $\bigcup_{s=1}^{N} c_s \times I_s$ consisting of a large number $N$ of chords consisting of nerves sending electrical impulses. Each chord has an endpoint, one in the retina at a point $x_s = c_s \times \{0\}$ and one in the brain at $y_s = c_s \times \{1\}$.

Hypothesis 2.1. For any $s = 1, \ldots, N$ the frequency and amplitude of the lightwave emitted at $x_s$ is proportional to the frequency and amplitude of the electric charge at $y_s$.\footnote{For instance by a distant star making a tangent to a planet one wishes to explore}\footnote{And as long as there are no airpolluting planes nearby...}
This hypothesis is made in observance with a ground breaking paper [1] showing that acoustic waves produces a similar electromagnetic wave in the brain. So am image is seen by the observer and at some point in the brain an electric pulse goes off. We model this as having a pair of cells $(y_s, \tilde{y}_s)$ and a current $C_s$ between them. Now $C_s$ can be measured by a laser voltmeter or by simply shooting a laser at $y_s\tilde{y}_s$ and measuring the deflection and decrease of the light. We will dwell on the subject slightly.

Remark 2 (Laser communication). Shooting one laser $l_1$ the width of which is the diameter $\mu$ of the visual nerve and a second laser $l_2$ which also has an impact diameter of $\mu$ and which is orthogonal to $l_1$, one can retrieve what another person sees by measuring the deflections and decreases of the light. This is because one only needs two parameters at each part of the image the person sees namely amplitude and frequency. This might be useful to find for instance a person who has been kidnapped. Since one can also transmit an image (or a sound wave stored as an electromagnetic wave) via a laser onto the persons eye nerve (respectively ear nerve) one could also transmit information in this way. And taking this further one could imagine people communicating with one another in this way because when we think we also hear what we think so a Cochlear hearing nerve reacts and this can be recorded by sending a laser from $A$ onto that nerve and receiving at $B$. This will be a tiny perturbation $1 + m_1 \ldots m_l$ of the signal $1$ when the person is not thinking and using machine learning on the perturbation and common words in the persons native language one can figure out what words $m = m_1 \ldots m_l$ represents. But will this be secure? If $A$ sends to $A'$ a message $m \in \{0, 1\}^n$ then $A'$ will not understand it nor be able to decrypt it in a sleigh of hand if $A'$ encrypted it. So messages will always be received through an open channel and encryption is a waste of time. But if one is interested in protecting the thoughts (or memories as we will see) of $A'$ one should further perturb the signal from $A \rightarrow A' \rightarrow B$ by shooting a laser with pseudorandom amplitude at the receiving end $A' \rightarrow B$. This makes the observation of $A'$ secure. For $A'$ to communicate with $A''$ one consider $B \rightarrow A'' \rightarrow A$. One can then again decrypt the pseudorandom amplitude by XORing with itself at $B$ then repeat the above step.

We remarked that the electric current $C_s$ at a synapse can be measured remotely. But how does the brain recognize the image a minute later? The above hypothesis is only valid at time $T = 0$ when the light is emitted and we see the blue-white image. Before we adress this question we shall introduce another hypothesis.

Hypothesis 2.2. The Principle of Locality Nearby points in the field of vision corresponds to nearby points in the sight centre. Nearby points in the sight centre are stored at nearby points. In other words for any of the following metrics $d_{loc}, d_\lambda, d_{loc} : \mathbb{R}^3 \times \mathbb{R}^3 \rightarrow \mathbb{R}$ measuring locality, frequency and amplitude of electromagnetic wave for all $t$ there is a $T$ such that if $t \leq T$ then for all $\epsilon(t) > 0$ there is $\delta > 0$ such that if $d_l(x_s, x'_s) < \delta$ then $d_l(y_s, \tilde{y}_s) < \epsilon$.

To test this hypothesis we propose the following experiment

**Experiment 1.**

1. At time $t = t_0$ shoot a laser at $x_s$ and let $(\omega_0, \lambda_0)$ denote the frequency of the light. Let $y_s$ denote the endpoint of the nerve chord. As before let $y_s\tilde{y}_s$.

2. At time $t = T$ at $y_s$ shoot a laser at microwave frequency $\lambda_0 + \lambda$. This boils a slight amount of the water in the cell and increases the pressure in the cell. This causes water to leak out and the Sodium Potassium ($Na^+K^+$) mechanism is thereby disturbed so that an electromagnetic wave is emitted. If the Locality Principle is true this should be at a nearby cell to $y_s$ and at a nearby frequency/amplitude.

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4The author wishes to thank an anonymous commentator "Jon" for substantiating the following hypothesis
The above experiment can without loss of technicality be performed not just at a locus of the retina \( x = x_s \) and so forth but at a region \( D_\eta(x) \) with a frequency spectrum \( D_\lambda(\lambda_0(x)) \). Let \( t = t_0 \). We will call
\[
J = D_\epsilon(x) \times D_\lambda(\lambda_0(x))
\]
an image centered at \( x \), which we can take to be the centre of the field of vision. By performing the above experiment one obtains at time \( t = T \) a region
\[
\tilde{J} = D_\delta(y) \times D_\lambda(\lambda_0 + \lambda)
\]
containing the memory of the previous image.

We believe that it is reasonable to propose that the cell consumes energy to store information. By the conservation of energy the following holds; the larger \( T \) is the larger the energy \( \lambda \) required to release a memory. One could ask oneself if perhaps the brain's cells stores information chemically or biologically.

3.

References


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\(^5\)Since our vision is two dimensional we are dealing with discs defined by the respective metrics