How To Give Strong Technical Presentations

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Biological Fact I: Text Versus Images

Speech
Text

Verbal channel

Images

Visual channel

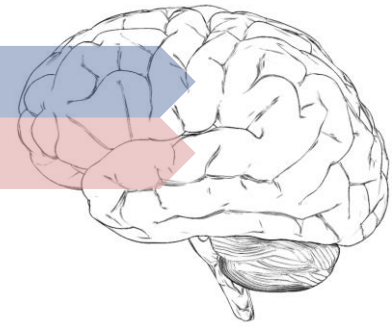


Image: http://www.illuminati-news.com/technology.htm

You cannot read and listen at the same time

Ideally

You talking

Verbal channel

Slides

Visual channel

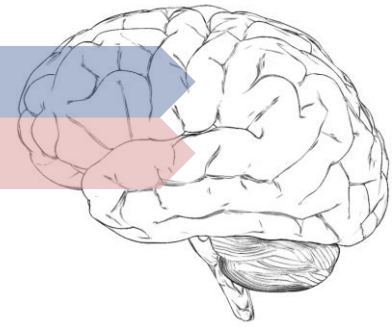


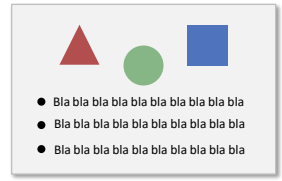
Image: http://www.illuminati-news.com/technology.htm

Handling the Medium

"Teleprompter"

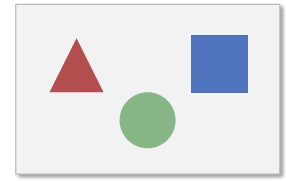
Really bad

"Slideument"



Better

Presentation



Ideal
(not always possible)

5

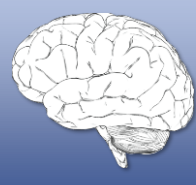
Nancy Duarte, Slide:ology

Minimize Text

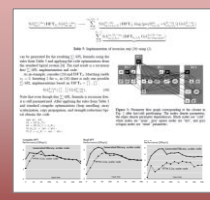
6

Good presentation slides
are not self-contained

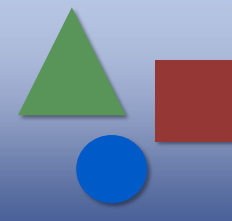
7



Basics



Content



Design

8

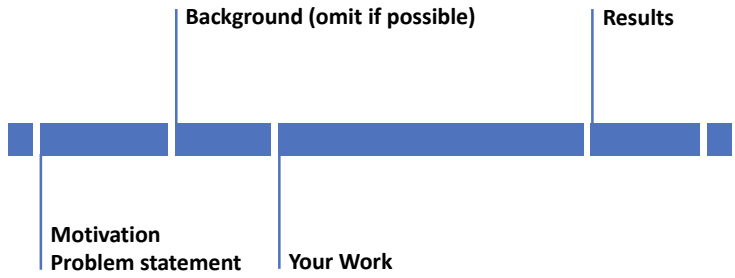
Note the transparency trick

Be Clear About the Goal

~~***Goal 1:*** *In these 30 minutes explain the entire approach and technology including all relevant details*~~

Goal 2: *In these 30 minutes explain what main problem the technology addresses, one or two key ideas in the approach, and one or two key results. Get people excited to learn more.*

Typical Organization



Not every slide needs a title

Motivation
Problem statement

- ***What? Why? Why important?***
- **Exceptionally clear**
- **If possible, precise problem statement:**
  - Given …., we want to compute …
  - Input: …., Output: ….
  - Block diagram showing input/output
- **Start interesting**
  - example result
  - interesting fact plus source
  - anything that starts the story

A presentation is a story
that starts on the first slide

The Problem

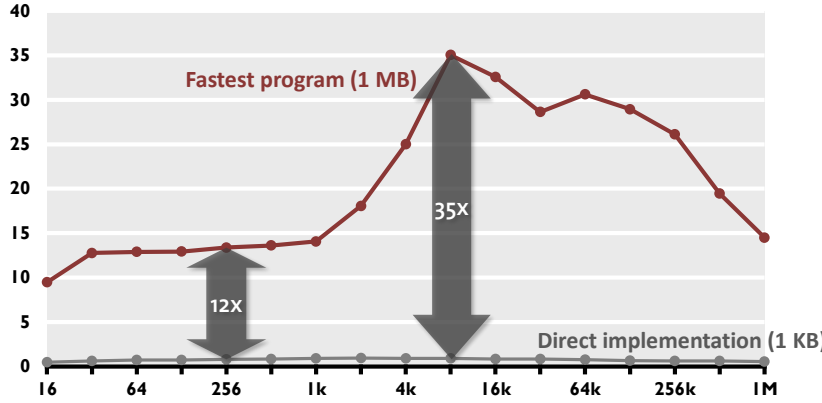
- **Computers architectures have become more complex**
  - Memory hierarchies
  - Vector extensions
  - Multiple cores
- **Optimizing for software for these features is very difficult**
  - Compilers f to do it
  - Hence the tw velo er s to it
  - Requires hit tu and go thm pe se: pe siv
- **Performance does not port**
  - Needs re-optimization for every new processor
  - Without optimization: often 10x performance loss
- **Particularly noticeable for computing functions**
  - Matrix multiplication
  - Discrete Fourier transform
  - others

Don’t start with a text-only bullet slide

Example first slide: good

The Problem: Example DFT

Discrete Fourier transform (single precision) on Intel Core i7 (4 cores)
Performance [Gflop/s]



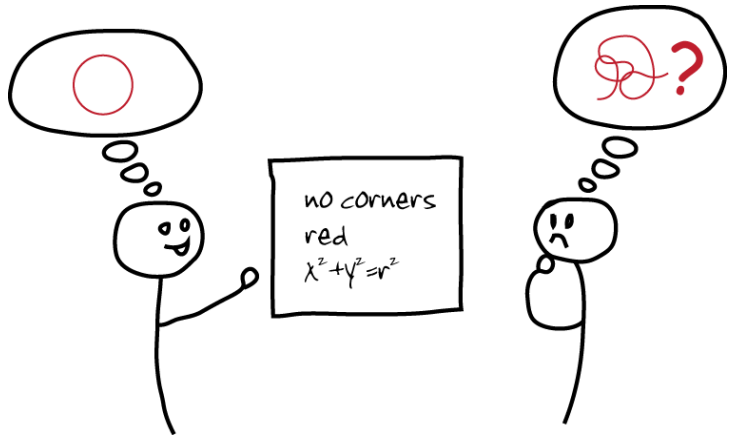
- Same operations count
- Best compiler and flags

- Communicate main idea(s) and approach
- Do not (try to) communicate every detail of your work
- *How to explain technical work well?*

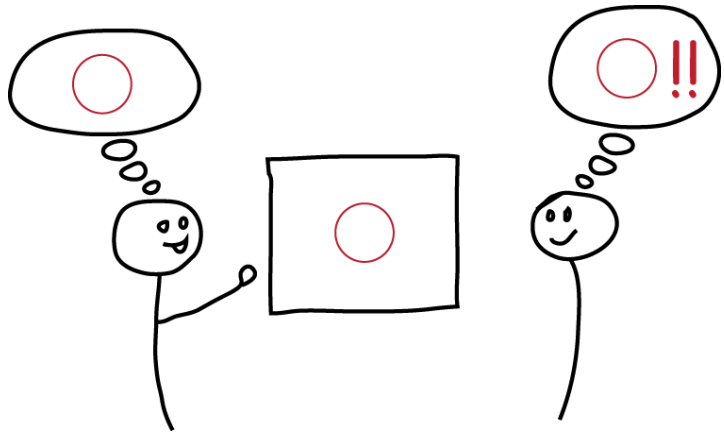
Explaining well

- *Visualize*
- *Use examples not generic explanations*
- *Small example, full truth*

Don’t just talk about it ….



… show it!



Example: not so good

Statistical Classification: C4.5

- **C4.5 generates decision trees from training data**
- **The trees can be used for classification**
- **Formally:**
  - Input: Training set of size m; each member has n features

Features *Classes*

Samples

$$\begin{array}{cccc|c} x_{1,1} & x_{1,2} & \dots & x_{1,n} & c_1 \\ x_{2,1} & x_{2,2} & \dots & x_{2,n} & c_2 \\ \dots & \dots & \dots & \dots & \dots \\ x_{m,1} & x_{m,2} & \dots & x_{m,n} & c_m \end{array}$$

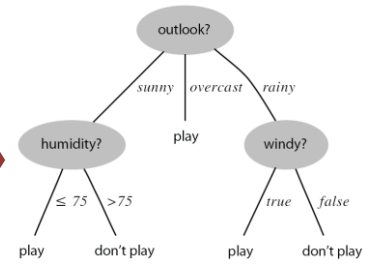
  - Output: decision trees mapping samples to classes

Example: good

Statistical Classification: C4.5

Outlook	Temperature	Humidity	Windy	Decision
sunny	85	85	false	don't play
sunny	80	90	true	don't play
overcast	83	78	false	play
rain	70	96	false	play
rain	68	80	false	play
rain	65	70	true	don't play
overcast	64	65	true	play
sunny	72	95	false	don't play
sunny	69	70	false	play
rain	75	80	false	play
sunny	75	70	true	play
overcast	72	90	true	play
overcast	81	75	false	play
rain	71	80	true	don't play

C4.5



P(play|windy=false) = 6/8
P(don't play|windy=false) = 2/8
P(play|windy=true) = 1/2
P(don't play|windy=false) = 1/2

H(windy=false) = 0.81

H(windy=true) = 1.0

Entropy of Features

H(windy) = 0.89

H(outlook) = 0.69

H(humidity) = …

Example: context for next slide

Linear Transforms

$$\begin{pmatrix} y_0 \\ y_1 \\ \vdots \\ y_{n-1} \end{pmatrix} = y = Tx \leftarrow T\cdot \leftarrow x = \begin{pmatrix} x_0 \\ x_1 \\ \vdots \\ x_{n-1} \end{pmatrix}$$

Output ***Input***

Example: $T = \mathrm{DFT}_n = [e^{-2k\ell\pi i/n}]_{0 \le k,\ell < n}$

Example: bad

Fast Fourier Transforms (FFTs)

- **Can be expressed as structured matrix factorizations**

$$\mathbf{DFT}_{mn} = (\mathbf{DFT}_m \otimes I_n) T^{mn}_m (I_m \otimes \mathbf{DFT}_n) L^{mn}_m$$

- **Formalism:**

L^{mn}_n	$in + j \mapsto jm + i, \quad 0 \le i < n,\ 0 \le j < m$
I_n	$n \times n$ identity matrix
$A \otimes B$	$[a_{k,\ell} B]_{0 \le k,\ell < n},\ A = [a_{k,\ell}]$
T^{mn}_m	a diagonal matrix

Example: good (small example)

Fast Fourier Transform: Size 4

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & i & -1 & -i \\ 1 & -1 & 1 & -1 \\ 1 & -i & -1 & i \end{bmatrix} x = \begin{bmatrix} 1 & \cdot & 1 & \cdot \\ \cdot & 1 & \cdot & 1 \\ 1 & \cdot & -1 & \cdot \\ \cdot & 1 & \cdot & -1 \end{bmatrix} \begin{bmatrix} 1 & \cdot & \cdot & \cdot \\ \cdot & 1 & \cdot & \cdot \\ \cdot & \cdot & 1 & \cdot \\ \cdot & \cdot & \cdot & i \end{bmatrix} \begin{bmatrix} 1 & 1 & \cdot & \cdot \\ 1 & -1 & \cdot & \cdot \\ \cdot & \cdot & 1 & 1 \\ \cdot & \cdot & 1 & -1 \end{bmatrix} \begin{bmatrix} 1 & \cdot & \cdot & \cdot \\ \cdot & \cdot & 1 & \cdot \\ \cdot & 1 & \cdot & \cdot \\ \cdot & \cdot & \cdot & 1 \end{bmatrix} x$$

12 adds, 4 mults *4 adds* *1 mult* *4 adds*

Matrix formalism:

$$\mathbf{DFT}_4 = (\mathbf{DFT}_2 \otimes I_2) T^4_2 (I_2 \otimes \mathbf{DFT}_2) L^4_2$$

Other Transform Algorithm

$$\mathbf{DFT}_n \to P_{k/2,2m}^{\top}\left(\mathbf{DFT}_{2m} \oplus \left(I_{k/2-1} \quad {}_i C_{2m}\,\mathbf{rDFT}_{2m}(i/k)\right)\right)\left(\mathbf{RDFT}'_k \quad I_m\right), \quad k \text{ even},$$

$$\begin{vmatrix}\mathbf{RDFT}_n\\ \mathbf{RDFT}'_n\\ \mathbf{DHT}_n\\ \mathbf{DHT}'_n\end{vmatrix} \to (P_{k/2,m}^{\top} \quad I_2)\left(\begin{vmatrix}\mathbf{RDFT}_{2m}\\ \mathbf{RDFT}'_{2m}\\ \mathbf{DHT}_{2m}\\ \mathbf{DHT}'_{2m}\end{vmatrix} \oplus \left(I_{k/2-1} \quad {}_i D_{2m} \begin{vmatrix}\mathbf{rDFT}_{2m}(i/k)\\ \mathbf{rDFT}_{2m}(i/k)\\ \mathbf{rDHT}_{2m}(i/k)\\ \mathbf{rDHT}_{2m}(i/k)\end{vmatrix}\right)\right)\begin{pmatrix}\mathbf{RDFT}'_k\\ \mathbf{RDFT}'_k\\ \mathbf{DHT}'_k\\ \mathbf{DHT}'_k\end{pmatrix} \quad I_m\Big), \quad k \text{ even},$$

$$\begin{vmatrix}\mathbf{rDFT}_{2n}(u)\\ \mathbf{rDHT}_{2n}(u)\end{vmatrix} \to L_m^{2n}\left(I_k \quad {}_i \begin{vmatrix}\mathbf{rDFT}_{2m}((i+u)/k)\\ \mathbf{rDHT}_{2m}((i+u)/k)\end{vmatrix}\right)\left(\begin{vmatrix}\mathbf{rDFT}_{2k}(u)\\ \mathbf{rDHT}_{2k}(u)\end{vmatrix} \quad I_m\right),$$

$$\mathbf{RDFT\text{-}3}_n \to (Q_{k/2,m}^{\top} \quad I_2)\,(I_k \quad {}_i\,\mathbf{rDFT}_{2m})(i+1/2)/k))\,(\mathbf{RDFT\text{-}3}_k \quad I_m), \quad k \text{ even},$$

$$\mathbf{DCT\text{-}2}_n \to P_{k/2,2m}^{\top}\left(\mathbf{DCT\text{-}2}_{2m}\,K_2^{2m} \oplus \left(I_{k/2-1} \quad N_{2m}\,\mathbf{RDFT\text{-}3}_{2m}^{\top}\right)\right) B_n(L_{k/2}^{n/2} \quad I_2)(I_m \quad \mathbf{RDFT}'_k)Q_{m/2,k},$$

$$\mathbf{DCT\text{-}3}_n \to \mathbf{DCT\text{-}2}_n^{\top},$$

$$\mathbf{DCT\text{-}4}_n \to Q_{k/2,2m}^{\top}\left(I_{k/2} \quad N_{2m}\,\mathbf{RDFT\text{-}3}_{2m}^{\top}\right) B'_n(L_{k/2}^{n/2} \quad I_2)(I_m \quad \mathbf{RDFT\text{-}3}_k)Q_{m/2,k}.$$

$$\begin{aligned}
\mathbf{DFT}_n &\to (\mathbf{DFT}_k \quad \mathrm{I}_m)\,\mathsf{T}_m^n(\mathrm{I}_k \quad \mathbf{DFT}_m)\,\mathsf{L}_k^n, \quad n = km\\
\mathbf{DFT}_n &\to P_n(\mathbf{DFT}_k \quad \mathbf{DFT}_m)Q_n, \quad n = km,\ \gcd(k,m) = 1\\
\mathbf{DFT}_p &\to R_p^T(\mathrm{I}_1 \oplus \mathbf{DFT}_{p-1})D_p(\mathrm{I}_1 \oplus \mathbf{DFT}_{p-1})R_p, \quad p \text{ prime}\\
\mathbf{DCT\text{-}3}_n &\to (\mathrm{I}_m \oplus \mathrm{J}_m)\,\mathsf{L}_m^n(\mathbf{DCT\text{-}3}_m(1/4) \oplus \mathbf{DCT\text{-}3}_m(3/4))\\
&\qquad \cdot(\mathsf{F}_2 \quad \mathrm{I}_m)\begin{bmatrix}\mathrm{I}_m & 0 \oplus -\mathrm{J}_{m-1}\\ \frac{1}{\sqrt{2}}(\mathrm{I}_1 \oplus 2\mathrm{I}_m)\end{bmatrix}, \quad n = 2m\\
\mathbf{DCT\text{-}4}_n &\to S_n\mathbf{DCT\text{-}2}_n\,\mathrm{diag}_{0\le k<n}(1/(2\cos((2k+1)\pi/4n)))\\
\mathbf{IMDCT}_{2m} &\to (\mathrm{J}_m \oplus \mathrm{I}_m \oplus \mathrm{I}_m \oplus \mathrm{J}_m)\left(\begin{bmatrix}1\\-1\end{bmatrix} \quad \mathrm{I}_m\right) \oplus \left(\begin{bmatrix}-1\\-1\end{bmatrix} \quad \mathrm{I}_m\right)\mathrm{J}_{2m}\,\mathbf{DCT\text{-}4}_{2m}\\
\mathbf{WHT}_{2^k} &\to \prod_{i=1}^{t}(\mathrm{I}_{2^{k_1+\cdots+k_{i-1}}} \quad \mathbf{WHT}_{2^{k_i}} \quad \mathrm{I}_{2^{k_{i+1}+\cdots+k_t}}), \quad k = k_1 + \cdots + k_t\\
\mathbf{DFT}_2 &\to \mathsf{F}_2\\
\mathbf{DCT\text{-}2}_2 &\to \mathrm{diag}(1, 1/\sqrt{2})\,\mathsf{F}_2\\
\mathbf{DCT\text{-}4}_2 &\to \mathrm{J}_2\mathsf{R}_{13\pi/8}
\end{aligned}$$

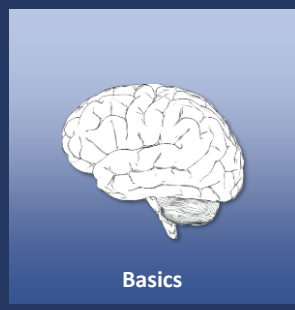
- **Precise experimental setup**
- **More later on data**

Common Mistakes

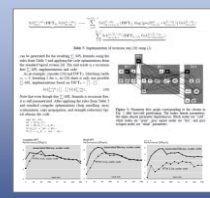
- **Thinking: If one can understand it well, people will think it's trivial**
- **Too many slides**
- **Slides too packed**

External Material

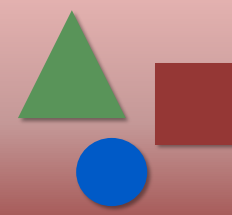
- **Everything included with copy-paste:**
  Images, graphics, text (even if only one sentence)
- ***Acknowledge source on the same slide!***
  bottom right, gray is one option



Basics



Content



Design

29

Design is about efficient communication,
not about making things pretty

30

Two Design principles

- *Alignment*
- *Layering*

Alignment

- **Everything is aligned to something else**
- **If in doubt align *left***

Example alignment: good

Nervousness

Top 10 fears

1. Fear of snakes
2. Fear of public speaking
3. Fear of heights
4. Fear of closed spaces
5. Fear of spiders (and insects)
6. Fear of needles
7. Fear of mice
8. Fear of flying
9. Fear of dogs
9. Fear of thunder
9. Fear of crowds

Source: U.S.A. Gallup Poll, February 18-21, 2001 (1,016 respondents)

- **Practice the presentation**
- **Be perfectly prepared**
- **Take every small opportunity to present**
- **If it's really bad**
  - Try some tricks from books
  - See a specialist

Layering

Hierarchical organization of elements through proper use of contrast, emphasis, and de-emphasis

Example good

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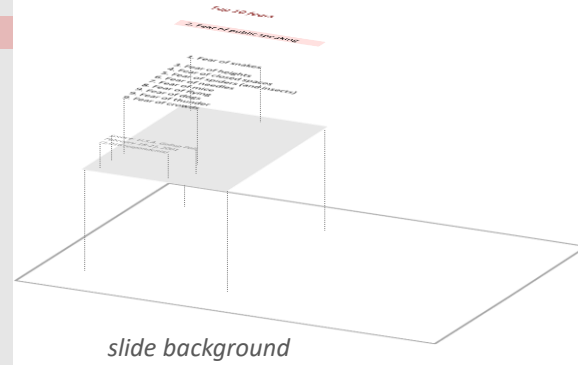

slide background

Example bad

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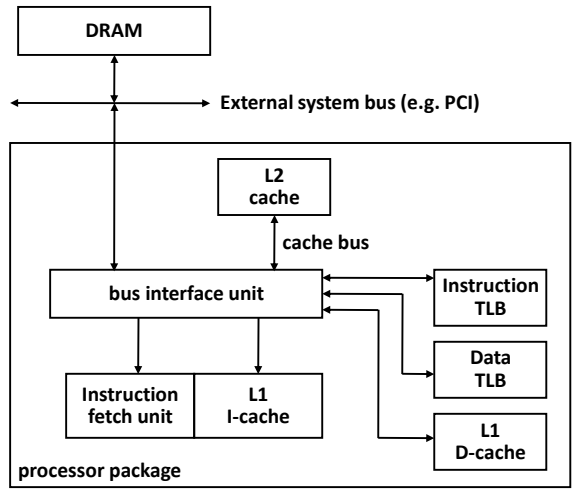
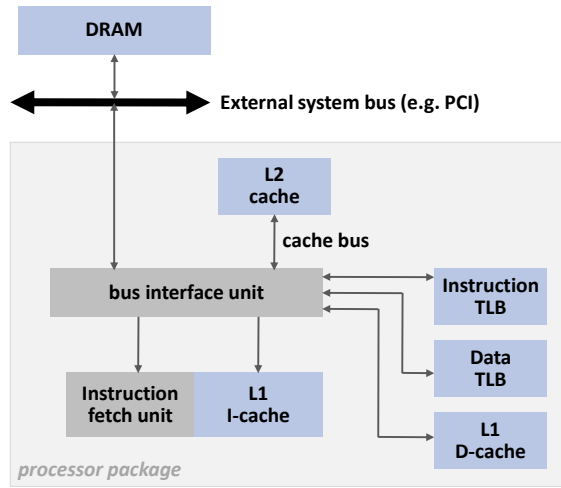
Example bad

P6 Memory System



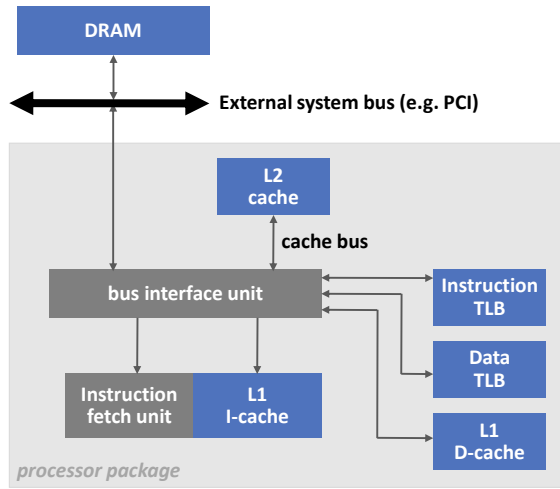
Example good

P6 Memory System



Example good

P6 Memory System



Example layering: good

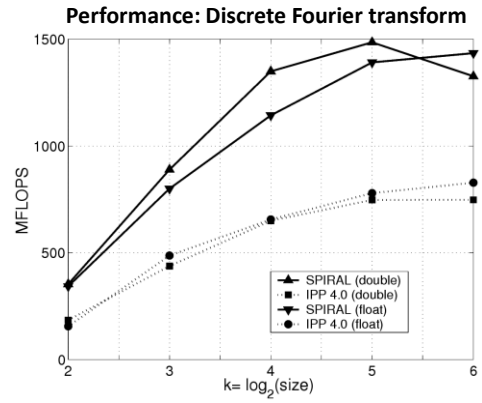
Code

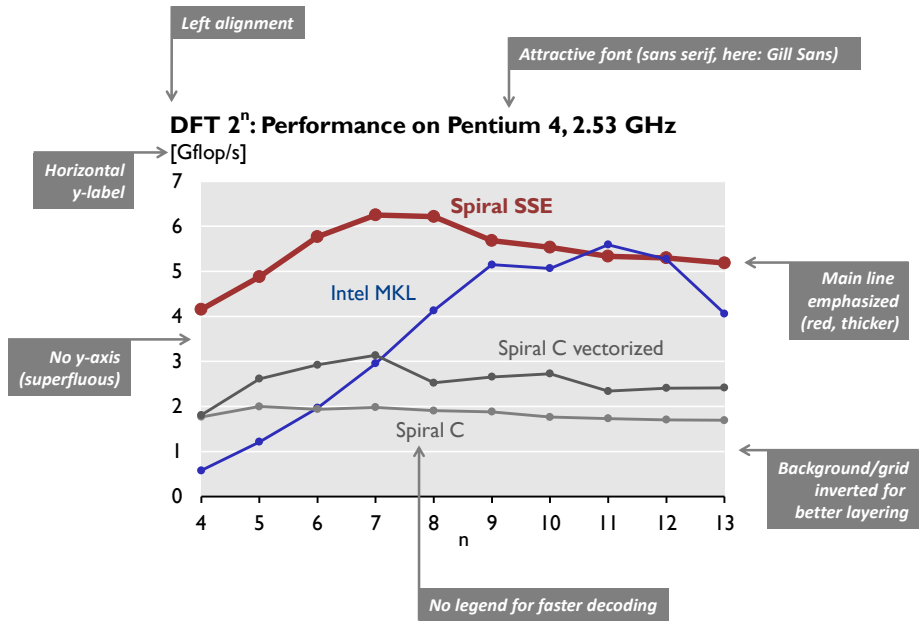
```
#include <ia32intrin.h>

// n a multiple of 4, x is 16-byte aligned
void addindex_vec(float *x, int n) {
  __m128 index, x_vec;

  for (int i = 0; i < n/4; i++) {
    x_vec = _mm_load_ps(x+i*4);           // load 4 floats
    index = _mm_set_ps(i+3, i+2, i+1, i); // create vector with indexes as values
    x_vec = _mm_add_ps(x_vec, index);     // add the two
    _mm_store_ps(x+i*4, x_vec);           // store back
  }
}
```

- **Fixed-width font (Consolas or Courier)**
- **Layering for readability**

Presenting a Viewgraph: Example

- **Start like this:**
  - We compare the performance of Spiral and IPP
  - The x-axis shows …., the y-axis shows
  - This means higher is better (or vice-versa)
  - For example, this datapoint means that ….
- **Now you can explain more**
- **Then conclude**
- ***But this plot is bad…***

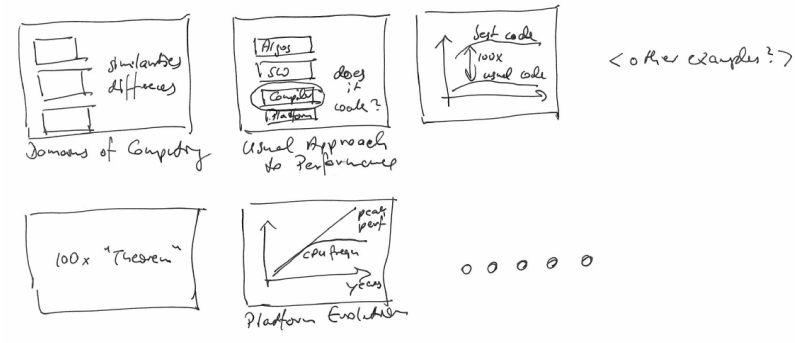




Final words

Creating a Presentation

- **Think about good visuals (diagrams, graphs, fotos, screenshots) to support the story; then sketch the presentation on paper**



How to Get Better

- **Study the principles and apply them**
- **Give your best in every presentation**
- **Learn to verbalize the reason for design decisions and for problems with a slide**
  - Explain and help others
  - Evaluate presentations you see
- **Reduce text more and more**
- **Think hard about visualizations and good examples**
- **Experiment**
- **Expand your knowledge**
  - Books (next slide)
  - Watch great presentations online (e.g., TED talks)

Last Tip:
Never end with a

Thank you!

slide

Some Books This Lecture Draws From

- Cliff Atkinson, ***Beyond Bullet Points***, Microsoft Press, 2005
- Nancy Duarte, ***Slide:ology***, O'Reilly, 2008
- Stephen Few, ***Show Me the Numbers***, Analytics Press, 2004
- Edward Tufte, ***Beautiful Evidence***, Graphics Press, 2006
- Edward Tufte, ***The Visual Display of Quantitative Information***, 2nd edition, Graphics Press, 2006
- Garr Reynolds, ***Presentation Zen***, New Riders, 2008
- Dan Roam, ***The Back of the Napkin***, Portfolio, 2008
- Robin Williams, ***The Non-Designer's Design & Type Books***, Peachpit Press, 2008