

# Computer Architecture Lab 6

210010019 & 210010054

## Cache Configuration:

Cache size	16B	128B	512B	1kB
Latency	1 cycle	2 cycles	3 cycles	4 cycles
Line Size	4B			
Associativity	2			
Write Policy	Write Through			

## Varying Instruction Cache:

**L1d=1024 B**

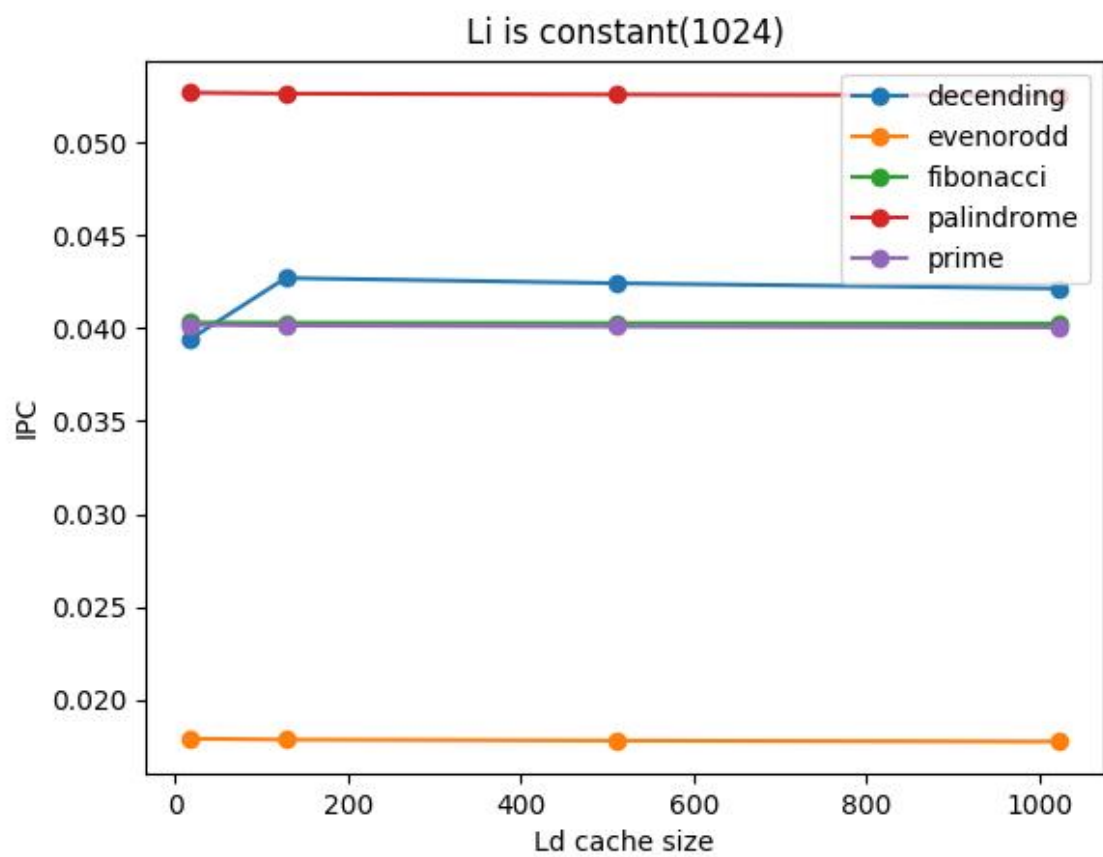
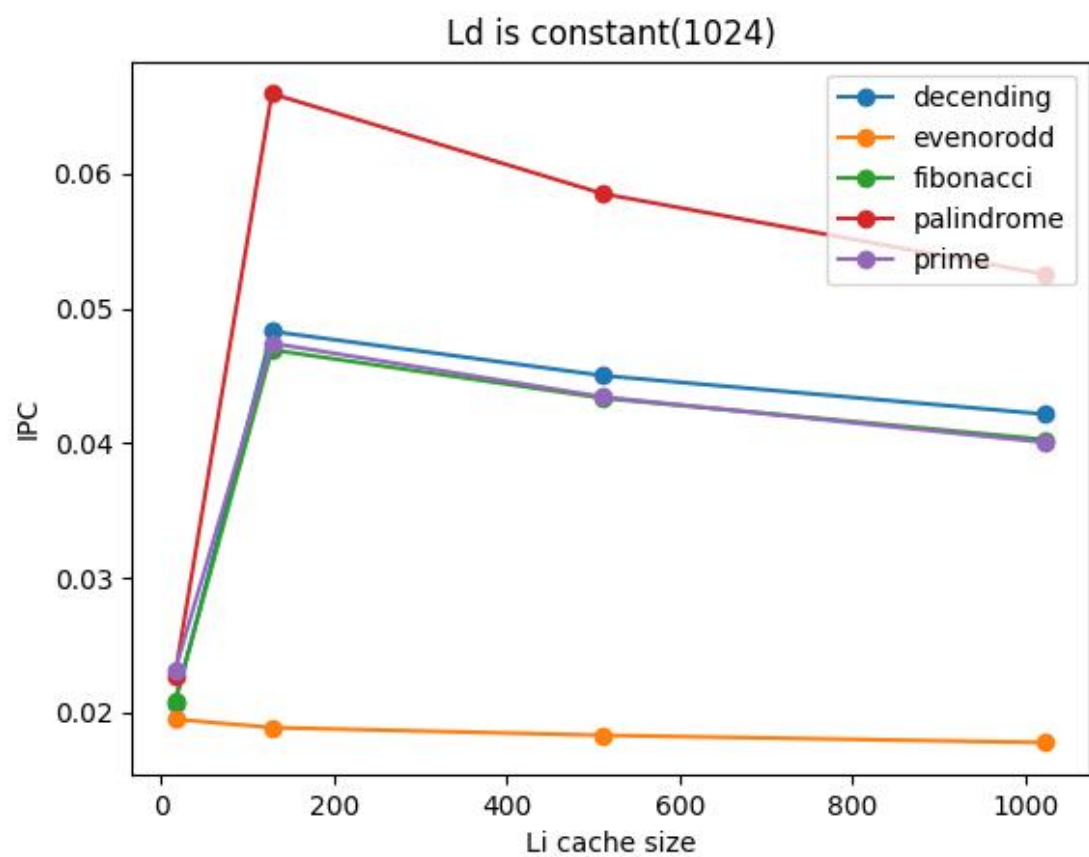
Program	Without Cache	L1i=16 B	L1i=128 B	L1i=512 B	L1i=1024 B
Descending	0.024931798	0.02066232	0.04829959	0.045011714	0.04214294
EvenorOdd	0.024330243	0.01948051	0.018867925	0.018292682	0.01775148
Fibonacci	0.02482679	0.02087961	0.046929605	0.043337945	0.04025696
Palindrome	0.024626208	0.02273650	0.06595995	0.058516197	0.052532833
Prime	0.024630541	0.02311352	0.047419805	0.043422733	0.040047113

## Varying Data Cache:

**L1i=1024 B**

Program	Without Cache	L1d=16 B	L1d=128 B	L1d=512 B	L1d=1024 B
Descending	0.024931798	0.039378572	0.042705044	0.04242213	0.04214294
EvenorOdd	0.024390243	0.017910447	0.017857144	0.017804155	0.01775148
Fibonacci	0.02482679	0.040308747	0.04029147	0.040274207	0.04025696
Palindrome	0.024626208	0.052681092	0.05263158	0.05258216	0.052532833
Prime	0.024630541	0.040189125	0.040141676	0.04009434	0.040047113

*Figure 1*



*Figure 2*

### **Observations:**

#### **L1i Cache Impact:**

- Adding a small L1 instruction cache at first slows down your computer.
- Then, as the cache gets bigger, your computer gets faster, except for one specific program.
- But if you keep making the cache larger, your computer slows down again.

#### **L1d Cache Impact:**

- Adding a small L1 data cache initially makes your computer faster.
- But as you make it even bigger, the speed gain starts to slow down.

#### **Optimal Cache Sizes:**

- There is a perfect size for both L1 instruction and data caches that makes your computer work at its best when dealing with lots of data.
- It's important to find the right balance in cache sizes to make your computer perform as well as possible.

#### **Impact of Cache Size on Latency and Hit Rate:**

- If you keep the data cache small and change the instruction cache, you'll see that the time it takes to do things and the success rate in finding data both get worse as the instruction cache gets bigger.
- There's an ideal size for the instruction cache that makes your computer work its fastest.

#### **Impact of Instruction Cache Size:**

- With a fixed small instruction cache and a changing data cache, you'll notice that the time it takes to do things goes up as the data cache gets bigger, but only up to a certain point. After that, it stays the same.
- So, making the instruction cache larger doesn't necessarily make your computer work better once it's big enough.

#### **Benchmarking with Descending Assembly Code:**

- There's a test with a simple computer program, and it shows that when you make both the data and instruction caches bigger from a small size to a medium size, the computer works much better.
- This means that picking the right cache size can make a big difference in how well your computer performs for specific tasks.