

CLP: Optimizations and SSA (WS 2018)

This exercise sheet will be discussed in the exercise sessions on December 18.

Exercise 1 Optimizations

```
1 // inputs: address 'ar' and integer 'n'
2 n0:
3   i ← 0
4   res ← 0
5   t ← ar + 4
6   s ← i * 4
7   goto n1
8 n1:
9   cond ← i < n
10  if cond then goto n2 else goto n6
11 n2:
12  t ← i * 4
13  s ← ar + 4
14  s ← s + t
15  ar_i ← load(s)
16  negative ← ar_i < 0
17  if negative then goto n3 else goto n4
18 n3:
19  res ← res - ar_i
20  goto n5
21 n4:
22  res ← res + ar_i
23  goto n5
24 n5:
25  i ← i + 1
26  goto n1
27 n6:
28  return res
```

- Draw the **control flow graph** for the given code.
- Compute the set of **live variables** (in + out) for each node the control flow graph.
- Compute the set of **available expressions** (in + out) for each node in the control flow graph.
- How can the code be optimized based on the results from b) and c)?
- Explain why the code is **not** in **SSA form**.
- Convert** the code to **SSA form**.