Assignment 4

- Answer the questions for each of the following algorithms (as discussed in class).

  1. Write a naive top-down recursive algorithm to compute nth Fibonacci number.

  2. Write a top-down memoized version of the previous algorithm to compute nth Fibonacci number.

  3. Write a bottom-up dynamic programming algorithm to compute nth Fibonacci number. [Note: Store the results of sub-problems in an array.]

  4. Write a bottom-up dynamic programming algorithm to compute nth Fibonacci number. [Note: Don't use an array to store the results of sub-problems.]

  5. Write a top-down dynamic programming algorithm to compute nth Fibonacci number using linear algebra.

  6. Write a bottom-up dynamic programming algorithm to compute nth Fibonacci number using linear algebra.

  Provide the details of Hardware/Software you used to implement the algorithms and to measure the time. Answer the following questions:

  1. Submit the pseudocode and time/space complexity analysis of the above algorithms.

  2. Submit the code (complete programs).

  3. Compare the performance of the above algorithms for the following inputs. Plot a graph (X - Input and Y - Running Time of the Algorithms). In a single graph, you should plot all six algorithms. The values of input n are as follows:

     - 1
     - 3
     - 11
     - 107
     - 8508
     - 3033018665
     - 9743646234360185430
     - 177011382145617908261934918471444127589

- 9404468686537716985772601572309280305961723506423561656342633485979029532787
- 92464899285964735885113871711741232238888025466135509123353211414899502298237386005843815329777280377901576500180386177993182491545061480256027030189664
- 1485423423154447240744082270334637061544009288314845715494846930643936280803233366455693247389417667096541644852119715843504343538838127918081511009788901584994290245553433694470047447860937518187905937727487527426099360263369702828921492696084806096934674489331397555633336203627326301396650776930731780147 75
- 2186655285076835579242458248058760768432746573660378248100310809093757018863066630408711930046140649526907913722561088685103788966258381206082022617375327037795939981439673222701964155934452874441587345998852987702534882772893162787754163095671664108778904366178041633090068569378775684298311058906012386511669431642059793070285567638525227005744898472736518808548918978527930625203742435960762898540945280223740467954883582400224673183343603397844562240492889243784776420578048794241614280484615995066724801730091229761998588732967241085924751488405326900579861559419951797649373089368206024192156183136159438 5484772
- 186224276312979052153357474195645251601271203772336215717713753006975313534550134774181998929025479006328883957036512315520273408747959599985430444849143540376427924730342542413716160607311177576848393101098269810268878632759234779730267806238790454075681391183188721687131276694297937696112720255941529685268971229306273639275825421901447667369341975504567515771119708321607140808144088936038331446581798660474008338357156262358697175811290953186329030277417684773611627199405852659525912632987217792213350258037356958443303850985239936327649848917760027868919211921068020586906847115928502004397519887238229057267276670510331166567006351345211072034481029205782652852175950930978796754736097733042199868108530243529791757279591346427002164488184337330710686018116467869488820182793491811234103434614614904607610809489342918855066356523593906091622844749561551639182410829116292634391839636952378738027072892422916499070504312810276259360551216129392641583555154287247718311774857498042111630263568076547813853482380385493947289812951785097278229006699404005576322299741301590481122157277078267374218090598567088072074852614803258858945800951972634719021287392371600554549973603942231571451850109710749885178659197822472861170659 95
- 429251134975334164742435795514808537291100694206342507498915275442277095754507643535401456146843920409859319679622321830528380888828979954685867684580935848086283872600898555456096644214569774054882703326822514057507749600148543902702178781176492164164088370709315487713450216773027807970591530499842482699489564376715990735234451361 65

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