Nifty Assignments

The Nifty Assignments session at the annual SIGCSE meeting is all about gathering and distributing great assignment ideas and their materials. For each assignment, the web pages linked below describe the assignment and provides materials — handouts, starter code, and so on.

Applying for Nifty is now done as its own track with a similar deadline to special sessions. The format and content of the .zip you submit is unchanged. See the info page for ideas about what makes a nifty assignment and how to apply for the Nifty session.

Please email any suggestions or comments to the nifty-admin email: nifty-admin@cs.stanford.edu
Nick's Home

Nifty Assignments 2022

Spelling Bee + Wordle - Eric Roberts, Jed Rembold	CS1 Fantastic string-logic, now with Wordle
Food Web Zombies - Ben Stephenson and Jonathan Hudson	CS1 Fun Graph Logic
Handwriting Recognizer - Stephanie Valentine	CS1 Graphical handwriting recognition with templates
Bias Bars - Nick Bowman, Katie Creel, Juliette Woodrow	CS1 Exploring bias in data, bringing ethics discussion into code
Reddit Bot - Mike Izbicki	CS1-2 Code to interact with reddit threads
Ray Marching - Joshua Crotts, Andrew Matzureff	CS1-2 Neat computational geometry

Nifty Assignments 2021

Sankey Diagrams - Ben Stephenson	CS1 Sankey diagram - neat data visualization algorithm
Rocket Landing Simulator - Adrian A. de Freitas and Troy Weingart	CS1 Rocket Landing Simulator - fun algorithm
Covid Simulator - Steve Bitner	CS1-CS2 Covid 2D infection simulator - timely if scary
Linked List Labyrinth - Keith Schwarz	CS2 Neat memory / debugger skill exercise, custom per student

Nifty Assignments 2020
Thanks to our presenters for getting everything together including videos for this COVID-interrupted year.

Typing Test - John DeNero et al	CS1 Fill in algorithm of fun typing-speed test. **(Video)** (intentionally silent)
Color My World - Carl Albing	CS1 or later: Students are given a data file, but no description about what it represents. Can they solve the mystery by generating a reasonable image?
Bar Chart Racer - Kevin Wayne	CS1 - use real data to make a animated bar chart - captivating! **(Video)**
DNA - Brian Yu, David J. Malan	CS1 or CS2 Neat DNA project. **(Video)**
Recursion to the Rescue - Keith Schwarz	Nifty recursion projects using tied to real-world applications. **(Video)**
Decision Makers - Evan Peck	Two hour exercise illuminating algorithms and life

Nifty Assignments 2019

Nifty Post It - Jeffrey L. Popyack	CS0-CS1 Hands On Manipulative
Hawaiin Phonetic Generator - Kendall Bingham	CS1 Fun Text
Motion Parallax - Ben Dicken	CS1 Awesome Graphic Experience
Gerrymandering - Allison Obourn	CS1-CS2 Election Data Analysis and Visualization
Code Crusher - Ben Stephenson	CS1-CS2 Great Popular Game + Code
Blocky - Diane Horton and David Liu	CS2 Recursion Tree Fabulous

Nifty Assignments 2018

Hurricane Tracker - Phil Ventura	CS0/CS1 Art of Wind
Mondrian Art - Ben Stephenson	CS1 Beautiful Recursion
Pong AI Tournament - Michael Guerzhoy	CS1 Build Pong AI
Wiki Racer - Ali Malik	CS2 Wiki Graph Race
Nifty Remixes - David Reed	CS1/CS2 High Level Nifty
Bear Maps - Josh Hug	(CS2) Bear Maps

Nifty Assignments 2017

Falling Sand - Dave Feinberg	CS1 Very engaging falling simulation
2048 in Python - Kunal Mishra	CS1 The fantastic 2048 game works great as a CS assignment
Fractal Sound - Josh Hug	CS1 Amazing sound generation and visualization
SAT Synonyms - Michael Guerzhoy	CS1-CS2 Fun big data application to the familiar SAT word problems
NBody Simulation - Kevin Wayne	CS2 Captivating gravity simulation. Gravity .. it's everywhere!

Nifty Assignments 2016

Mountain Paths -- Baker Franke	CS1 Neat simple algorithm in 2D arrays
Restaurant Recommendations Yelp Maps -- Brian Hou, Marvin Zhang, and John DeNero	CS1 Nifty data visualization of restaurant data
Rack-O Game -- Arvind Bhusnurmath, Kristen Gee, and Karen Her	CS1 Play and AI code for an easy game
Movie Review Sentiment -- Eric Manley and Timothy Urness	CS1/CS2 Neat word analysis from a surprisingly simple algorithm
HugLife -- Josh Hug	CS1/CS2 Grid simulation game that shows off testing
Autocomplete-me -- Kevin Wayne	CS2 Neat applied use of word storage and binary search

Nifty Assignments 2015

Counting Squares -- Mark Sherriff, Luther Tychonievich, and Ryan Layer	CS0/CS1 Neat and easy squares activity
Speed Reader -- Peter-Michael Osera	CS1 Nifty Animation
GeoLocator -- Stuart Reges	CS1 Fun Geo Data
Packet Sniffing -- Suzanne Matthews and David Raymond	CS1 Eye Opening Networking
Melody Maker -- Allison Obourn and Marty Stepp	CS1 Fun with Sound
Seam Carving -- Josh Hug	CS1/CS2 Amazing Image Resize Trick

Nifty Assignments 2014

Analyzing Google Books Dataset -- Josh Hug	CS1 Amazing Language Data in CS1
Game Of Sticks -- Antti Laaksonen and Arto Vihavainen	CS1 Neat Game "AI" from shockingly simple trick
Purple America -- Kevin Wayne	CS1 Big Map Data
Ants vs. SomeBees -- John DeNero, Tom Magrino, and Eric Tzeng	CS1 Riff Plants vs. Zombies
Segregation Simulation -- Frank McCown	CS1 Neat Real-World 2-d Modeling
Image Stacker and The Pesky Tourist -- John Nicholson	CS2 Two very neat 2-d image manipulations

Nifty Assignments 2013

Twitter Trends -- John DeNero and Aditi Muralidharan	CS0-CS1 Neat output with a hip big-data source
Collage -- Mark Guzdial	CS0 Novel media output by combining images
Authorship Detection -- Michelle Craig	CS1 Surprisingly effective data driven categorization with basic coding
Recursive TurtleGraphics -- Eric Roberts	CS1 Get at the essential recursive idea very easily
Campus Shuttle -- David Malan	CS1 Stunning graphical tour
Estimating Avogadro's Number -- Kevin Wayne	CS1/CS2 Surprisingly easy image processing of lab data to get a real-world result

Nifty Assignments 2012

Stereo Sound Processing -- Daniel Zingaro	CS1 (early) - Fun and impressive early in the quarter - remove vocals from sound
Guitar Heroine -- Kevin Wayne	CS1/CS2, Extremely neat -- math model creates realistic guitar sound
Uno -- Stephen Davies	CS1, Strategy AI to play Uno.
Image Editor -- Joshua T. Guerin and Debby Keen	CS1/CS2 Code to experiment with images, but requiring only the ability to change text files.
Igel Ärgern -- Zachary Kurmas	CS2 Hedgehogs in a Hurry game
Binary Bomb -- David O'Hallaron	Post CS2 -- neat assignment puzzle to play with understanding of compiled code and memory as they truly are. On the linked page, see the README, Writeup, Release Notes, Self-Study Handout which all work without a password. To play with the code, email Dave and he'll send you what you need to get the binaries.

Nifty Assignments 2011

Image Puzzles -- Nick Parlante	CS0 or later, great puzzles using images, tiny code required
BMP Puzzles -- David Malan	CS1, More and better image puzzles, looking at bytes of BMP file representation
Book Recommendations -- Michelle Craig	CS1, Like the Netflix movie-recommendation system, generate book recommendations. Surprisingly simple algorithms give a neat results.
Generic Scrolling Game -- Dave Feinberg	CS1, Project pattern which supports a variety of games. Easily allows students to customize rules, graphics etc. of simple game.
Wator World -- Mike Scott	CS1-CS2, Shark/fish simulation using GridWorld type abstraction. Neat simulation/modeling example working from simple rules.
Hamming Codes -- Stuart Hansen	CS2, Neat exercise with a real algorithm. Push the students to understand that it's really all bytes.
Evil Hangman -- Keith Schwarz	CS2 or late CS1 - Awesome variant of Hangman, where the computer cheats by dodging all the user's guesses

Nifty Assignments 2010

Picobot -- Zachary Dodds	CS0-CS1, day-1 assignment -- neat environment to get students started, works in the browser
Pig -- Todd Neller	CS1, intermediate difficulty game to implement, but students love it and lots of variations
Song Generator -- Daniel Zingaro	CS1, implement filters with short bits of code, but it all works in the domain of sound, making in a novel and engaging domain for the students
CSI: Computer Science Investigation -- David Malan	The instructor accidentally erases the compact flash card containing their images. Students write code to recover the images, solve the treasure hunt using the images
Encryption Chase -- Mark Sherriff	CS2, encryption coding, embedded in a team active-learning campus treasure hunt
Chatting Aimlessly (IM) -- Thomas Murtagh	CS1, implement simple instant messaging client in CS1 -- talk about a technology near to the student heart!

Nifty Assignments 2009

Star Map -- Karen Reid	CS1, neat drawing of the night sky and constellations -- simple file reading and drawing
Face Pamphlet -- Mehran Sahami	CS1, simple Facebook application built with just CS1 technology, students love it
Secrets In Images -- Brent Heeringa, Thomas Murtagh	CS1, hide secret messages inside images -- neat image manipulation with data as simple arrays
Random Art -- Christopher A Stone	CS1, build nifty images with recursive nested random symbolic math expressions (python)
Enigma Encryption -- Dave Reed	CS1-CS21, range of easy to complex cryptography projects, using paper/manipulation model to get started
DNA Splicing -- Owen Astrachan	CS2, surprisingly easy DNA manipulation, set up for the students to measure/experiment with their code

Nifty Assignments 2008

Catch Plagiarists -- Baker Franke	CS1-CS2, typical CS2 data structures, difficulty can be adjusted. Search within a set of documents to find pairs with copied content
Genetic Algorithm TSP -- Raja Sooriamurthi	CS1-CS2, basic genetic algorithms. Use genetic algorithms to solve the traveling salesman problem
Asteroids -- Dan Leyzberg, Art Simon	CS1-CS2, objects, inheritance, abstract classes. An impressive implementation of Asteroids with OOP design and inheritance
Huffman Images -- Morgan McGuire, Tom Murtagh	CS1(late) or CS2(early). Labs to explore huffman compression in the context of image bitmap manipulation
Maze Solver -- Don Blaheta	CS2, stacks, queues, 2d arrays. Play around with algorithms to solve a maze. Works with gridworld
Dice Flip -- Cay Horstmann	CS1-CS2, prolog for advanced CS2, java for late CS1 variant. Explore simple but subtle dice game

Nifty Assignments 2007

Media Manipulation -- John Cigas	CS0-CS1, spreadsheet use or basic code. Transfer media data to spreadsheet form to make manipulation easy
ASCIImations -- Dave Reed	CS0-CS2. ASCII animations make fun, creative output with surprisingly simple code (Javascript, Java, ...)
Mindreader -- Raja Sooriamurthi	CS1, CS2. basic logic, map interface (arrays or Hashmaps). Build a surprisingly good computer opponent for a guessing game
Solitaire OOP -- Robert Noonan	CS2, OOP and patterns to explore family of solitaire games
Sliding Blocks Puzzle -- Mike Clancy	CS2, significant recursion and data structures. Recursive and heuristic work to solve the sliding blocks puzzle.
Fire -- Angela Shiflet	CS2, 2-d arrays, simulation. Neat, real-world example simulating spread of fire across a terrain, depending on humidity etc.

Nifty Assignments 2006

Book Code (ISBN) -- John Motil	CS1, basic logic to play with ISBN numbers. Fun because we are surrounded by these numbers .. use them for basic examples
Natural Prestidigitation -- Steve Wolfman	CS1, basic logic, loops, arrays. Appears dull, but has a neat surprise ending.
Breakout -- Eric Roberts	CS1, basic logic, loops using ACM graphics early in the term
Dancing Turtles -- Chris Nevison	CS1, inheritance with dancing turtles and ACM graphics
Solitaire Encryption -- Lester I. McCann	CS2, list manipulations, algorithmic code, file reading. Implements a very novel type of encryption.
Anagram Solver -- Stuart Reges	CS2, recursive backtracking ... a very fun application of recursive search
RSS Reader -- Jerry Cain	CS2, data structures, networking ... neat to implement a client for a real protocol

Nifty Assignments 2005

Test Me -- David Levine	CS0-CS1, students write tests to examine black box code -- nifty and no code writing
Grid Plotter -- Alyce Brady and Pam Cutter	CS1, neat way to learn and practice loop code
Complementary Currency -- Paul Kube	CS1, OOP by creating a currency ... has a community/social aspect among the students
Name Surfer -- Nick Parlante	CS1, loops, arrays, files. Graph baby name data for the last 100 years. Nifty because the data is nifty.
Photomosaics PPT (PDF version) -- Rich Pattis	CS2, create image made of many little images .. but there is a patent on it
Image Lab -- Aaron Gordon	CS2, framework to allow students to write filters on 2-d data and see them applied to images

- **Nifty Assignments 2004**
  - Summaries from the proceedings
  - Talk Like a Pirate -- Dave Reed
  - Minesweeper -- Jeff Lehman
  - Card Games John Estell
  - Digital Signatures -- Donald Chinn
  - Rabbit Hunt -- David Matuszek

- Nifty Assignments 2003
  - Virtual Pests -- Jeffrey L. Popyack -- a fun CS1 assignment using JavaScript
  - Pong -- Grant Braught -- a neat "objects first" assignment
  - Lunar Lander -- Stuart Reges -- another fun "objects first" assignment
  - HTML Browser -- Scott Dexter and Chaya Gurwitz -- CS2 assignment to render HTML
  - Backtracking -- Stephen Weiss -- CS2 all about backtracking
  - Random Writer -- Joe Zachary -- a neat CS2 data structure problem

- Nifty Assignments 2002
  - Blurbs from the proceedings
  - Shall We Play A Game? -- Dan Garcia -- A system where students can play around with game playing AI (CS0)
  - Neat Javascript projects -- Dave Reed -- Using Javascript as a simple introduction to programming (CS0)
  - Adventure -- John Estell -- Using the classic adventure game as a largish project (CS2)
  - Sorting Detective -- David Levine -- A fun variation on the old "sorting algorithms" homework (CS2)
  - Boggle -- Julie Zelenski (in cahoots with Owen Astrachan) -- Using the Boggle game to explore recursive algorithms and data structure tradeoffs (CS2)

- Nifty Assignments 2001
  - Blurbs from the proceedings
  - Windows and Regions -- Mike Clancy -- an algorithmic problem using 2-d regions. An excuse to do some linked-list (or ArrayList) type manipulation. Give the students a feel for "window" manager region operations.
  - Personality Test -- Stuart Reges -- sort and match the personality data of the class (more fun than it sounds!)
  - Quilt -- Julie Zelenski -- a fun, drawing-intensive CS1 project that emphasizes decomp
  - Word Ladder -- Owen Astrachan -- a string manipulation puzzle
  - Tetris -- Nick Parlante -- a large OOP project, with a tetris board, tetris piece, tetris game, and a pluggable tetris brain . Can be used as a small project where students just write a Tetris brain and plug it in, or can be used as a large CS2 OOP project. The nifty materials include a runnable JTetris.jar sample, and an Instructor's Guide

- Nifty Assignments 1999
  - Blurbs from the proceedings
  - Cat And Mouse -- Mike Clancy -- (CS1) a cute problem which requires non-trivial geometry and algorithms, but can be solved in 100 lines.
  - Bagels -- Stuart Reges -- (CS1) a fun game with some algorithmic complexity.
  - DNA -- Richard E. Pattis -- (CS1) great first data structures and performance tuning problem.
  - Huffman Coding -- Owen Astrachan -- (CS2) decomposition and data structures.
  - The Random Sentence Generator -- Julie Zelenski -- (CS2) a fun use of grammars, recursion, and ADTs.
  - Darwin's World -- Nick Parlante -- (CS2) a simulator featuring decomposition and a simple interpreter.

Also of interest: The Stanford CS Education Library of free CS Education Materials, home of the Binky Pointer Video!