Problem Solving Training

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[Spring 2021]


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Mohamed Ayman

Experience

- Valeo [2019 - Present]
  - Deep Learning Researcher
  - Algorithm Software Engineer
- The American University in Cairo (AUC) [2019 - Present]
  - Research Assistant
  - Teaching Assistant
- ICPC - International Collegiate Programming Contest [2016 - Present]
  - Coach
  - Mentor

Problem Solving Training

github.com/cs-MohamedAyman/Problem-Solving-Training/blob/master/README.md

Lecture Agenda

We will discuss in this lecture the following topics

1- Introduction to Training

2- Training Content and Timeline

3- Practice on Online Judges

4- Programming Competitions

5- Tutorials and References

6- Online Courses


Let's
START UP

Lecture Agenda

Section 1: Introduction to Training

Section 2: Training Content and Timeline

Section 3: Practice on Online Judges

Section 4: Programming Competitions

Section 5: Tutorials and References

Section 6: Online Courses

Introduction to Training

Level 1

Level 2

Level 3

Level 4

Introduction to Training

Level 1	Level 2	Level 3	Level 4
3 Months	6 Months	1 Year	3 Years

Introduction to Training

Introduction to Training

TOO HEAVY

TOO LIGHT

Lecture Agenda

- ✔ Section 1: Introduction to Training
- **Section 2: Training Content and Timeline**
- Section 3: Practice on Online Judges
- Section 4: Programming Competitions
- Section 5: Tutorials and References
- Section 6: Online Courses

Training Content and Timeline

Level 1

Prerequisite Knowledge: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

github.com/cs-MohamedAyman/Problem-Solving-Training/blob/master/README.md#level-1

Level 2

Prerequisite Knowledge: github.com/cs-MohamedAyman/Data-Structures-and-Algorithms-Analysis-Training

github.com/cs-MohamedAyman/Problem-Solving-Training/blob/master/README.md#level-2

Level 3

Prerequisite Knowledge: github.com/cs-MohamedAyman/Advanced-Data-Structures-and-Algorithms-Analysis-Training

github.com/cs-MohamedAyman/Problem-Solving-Training/blob/master/README.md#level-3

Level 4

Prerequisite Knowledge: github.com/cs-MohamedAyman/Advanced-Data-Structures-and-Algorithms-Analysis-Training

github.com/cs-MohamedAyman/Problem-Solving-Training/blob/master/README.md#level-4

Training Content and Timeline

Level 1

15 weeks

`Python Programming Language` Lectures

Module 1	Python Basics and Functions	Module 2	Python Collections and Strings
Lecture 01	Python Overview	Lecture 07	Strings
Lecture 02	Variable Types	Lecture 08	Lists
Lecture 03	Basic Operations	Lecture 09	Tuples
Lecture 04	Conditions	Lecture 10	Dictionaries
Lecture 05	Loops	Lecture 11	Sets
Lecture 06	Functions	Lecture 12	Numbers

`Cpp Programming Language` Lectures

Module 1	Cpp Basics and Pointers	Module 2	Cpp Arrays and Functions
Lecture 01	Cpp Overview	Lecture 07	Arrays
Lecture 02	Variable Types	Lecture 08	Functions
Lecture 03	Basic Operations	Lecture 09	Strings
Lecture 04	Conditions	Lecture 10	Structures
Lecture 05	Loops	Lecture 11	Enumerations and Unions
Lecture 06	Pointers and References	Lecture 12	Numbers

Training Content and Timeline - Level 1

	[Week 01 - Week 02] HackerRank Sheets	2 weeks
	[Week 03 - Week 05] Codeforces Sheets 1.1, 1.2	3 weeks
	[Week 06 - Week 08] Codeforces Sheets 1.3, 1.4	3 weeks
	[Week 09 - Week 10] HackerEarth Sheets	2 weeks

Training Content and Timeline

Level 2

15 weeks

`Data Structures` Lectures

Module 1	Linear Data Structures	Module 2	Non-Linear Data Structures
Lecture 01	Complexity Analysis	Lecture 08	Binary Tree
Lecture 02	Array	Lecture 09	Binary Search Tree
Lecture 03	Linked List	Lecture 10	AVL Tree
Lecture 04	Stack	Lecture 11	Red Black Tree
Lecture 05	Queue	Lecture 12	Binary Heap Tree
Lecture 06	Deque	Lecture 13	Hash Table
Lecture 07	Built-in Linear Data Structures	Lecture 14	Built-in Non-Linear Data Structures

`Algorithms Analysis` Lectures

Module 1	Basic Algorithms	Module 2	Graph Algorithms and Dynamic Programming
Lecture 01	Complexity Analysis	Lecture 07	Introduction to Graph
Lecture 02	Sorting Algorithms	Lecture 08	Shortest Path Algorithms
Lecture 03	Searching Algorithms	Lecture 09	Spanning Tree Algorithms
Lecture 04	Decrease and Conquer	Lecture 10	Greedy Algorithms
Lecture 05	Divide and Conquer	Lecture 11	Brute Force Algorithms
Lecture 06	Transform and Conquer	Lecture 12	Dynamic Programming

Training Content and Timeline - Level 2

[Week 01 - Week 02] HackerRank Sheets	2 weeks
[Week 03 - Week 05] LeetCode Sheets 2.1, 2.2	3 weeks
[Week 06 - Week 08] Codeforces Sheets 2.1, 2.2	3 weeks
[Week 09 - Week 11] LeetCode Sheets 2.3, 2.4	3 weeks
[Week 12 - Week 14] Codeforces Sheets 2.3, 2.4	3 weeks
[Week 15 - Week 17] LeetCode Sheets 2.5, 2.6	3 weeks
[Week 18 - Week 19] HackerEarth Sheets (data structures)	2 weeks
[Week 21 - Week 22] HackerEarth Sheets (algorithms analysis)	2 weeks

Training Content and Timeline

Level 3, 4

15 weeks

15 weeks

`Advanced Data Structures` Lectures

Module 1	Advanced Data Structures	Module 2	Advanced Data Structures
Lecture 01	Disjoint Set	Lecture 08	AA Tree
Lecture 02	Skip List	Lecture 09	K-Dimensional Tree
Lecture 03	Trie	Lecture 10	B/B+ Tree
Lecture 04	Segment Tree	Lecture 11	Sparse Tables
Lecture 05	Binary Indexed Tree	Lecture 12	Suffix Array
Lecture 06	Treap	Lecture 13	Suffix Tree
Lecture 07	Splay Tree	Lecture 14	Advanced Trees

`Advanced Algorithms Analysis` Lectures

Module 1	Mathematical and Geometric Algorithms	Module 2	String Algorithms
Lecture 01	Mathematical Algorithms I	Lecture 06	String Algorithms
Lecture 02	Mathematical Algorithms II	Lecture 07	String Compression Algorithms
Lecture 03	Geometric Algorithms I	Lecture 08	Pattern Searching Algorithms I
Lecture 04	Geometric Algorithms II	Lecture 09	Pattern Searching Algorithms II
Lecture 05	Advanced Graph Algorithms	Lecture 10	Advanced Dynamic Programming

Lecture Agenda

- ✔ Section 1: Introduction to Training
- ✔ Section 2: Training Content and Timeline
- **Section 3: Practice on Online Judges**
- Section 4: Programming Competitions
- Section 5: Tutorials and References
- Section 6: Online Courses

Practice on Online Judges

Practice on Online Judges - Level 1

Level 1

2 weeks

HackerRank OJ sheets

The HackerRank OJ sheets phase-1-cpp This sheet focus on c/c++ basic problems, It's divided into 8 classes of problems (Introduction - Conditionals and Loops - Arrays and Strings - Functions - Standard Template Libraries - Structs and Enums - Classes and Inheritance - Misc). It was ordered based on the problem difficulty and grouped by the problem type. Finally, this sheet contains ~70 problems. phase-1-python This sheet focus on python basic problems, It's divided into 6 classes of problems (Introduction - Basic Data Types - Collections - Functions - Standard Libraries - Classes). It was ordered based on the problem difficulty and grouped by the problem type. Finally, this sheet contains ~100 problems.

phase-1-cpp	60 problems	phase-1-python	100 problems
Introduction	15 problems	Introduction	5 problems
Conditionals and Loops	5 problems	Basic Data Types	20 problems
Arrays and Strings	10 problems	Collections	30 problems
Functions	5 problems	Functions	10 problems
Standard Template Libraries	5 problems	Standard Libraries	25 problems
Structs and Enums	5 problems	Classes	10 problems
Classes and Inheritance	15 problems		

Practice on Online Judges - Level 1

Level 1

8 weeks

Codeforces OJ sheets

The Codeforces OJ sheets phase-1-1, phase-1-2, phase-1-3, phase-1-4 contain A-Div2 problems, and each sheet of them divided into 5 classes of problems (Basic Operators - Conditions - Loops - Lists/Arrays - Strings). These sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~120 problems.

	phase-1-1	phase-1-2	phase-1-3	phase-1-4
	160 problems	**115 problems**	**115 problems**	**105 problems**
Basic Operator	15 problems	10 problems	5 problems	5 problems
Condition	15 problems	15 problems	20 problems	20 problems
Loop	35 problems	20 problems	25 problems	20 problems
String	35 problems	30 problems	30 problems	30 problems
List / Array	60 problems	35 problems	35 problems	30 problems

Practice on Online Judges - Level 1

Level 1

4 weeks

HackerEarth OJ sheets

The HackerEarth OJ sheets phase-1-1, phase-1-2, phase-1-3, phase-1-basic-programming contain implementation problems and basic programming problems. These sheets were ordered based on difficulty. Each sheet contains ~100 problems. It's divided into 4 classes of problems (Input/Output - Bit Manipulation - Recursion - Operators).

	phase-1-1	phase-1-2	phase-1-3	phase-1-basic-programming	
	100 problems	100 problems	100 problems	130 problems	
Implementation	25 problems	25 problems	25 problems	Input / Output	50 problems
Implementation	25 problems	25 problems	25 problems	Bit Manipulation	70 problems
Implementation	25 problems	25 problems	25 problems	Recursion	10 problems
Implementation	25 problems	25 problems	25 problems	Operators	5 problems

Practice on Online Judges - Level 2

Level 2

4 weeks

HackerRank OJ sheets

The HackerRank OJ sheets phase-2-data-structures, phase-2-algorithms-basics, These sheets contain linear and non-linear data structures problems plus advanced data structures problems, and basic algorithms problems. Also, these sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~120 problems.

phase-2-data-structures	120 problems	phase-2-algorithms-basics	120 problems
Arrays & Linked Lists	20 problems	Warm-up & Recursion	20 problems
Stacks & Queues	10 problems	Sorting	15 problems
Trees & Balanced Trees	25 problems	Search	25 problems
Heap & Disjoint Set & Trie	10 problems	Implementation I	30 problems
Advanced	50 problems	Implementation II	30 problems

Practice on Online Judges - Level 2

Level 2

8 weeks

Codeforces OJ sheets

The Codeforces OJ sheets phase-2-1, phase-2-2, phase-2-3, phase-2-4 contain B-Div2 problems, and each sheet of them divided into 5 classes of problems (Data Structure - Mathematics - String - Greedy - Brute Force). These sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~120 problems. For the last 2 sheets phase-2-div3-contests that focus on div3-contests (easy contests) and contains ~100 contests, and phase-2-educational-contests, that focus on educational-contests (medium contests) and contains ~100 contests. Finally phase-2-gym-contests that focus on gym-contests that contains ~200 contests.

	phase-2-1	phase-2-2	phase-2-3	phase-2-4
	120 problems	**130 problems**	**105 problems**	**145 problems**
Data Structure	10 problems	20 problems	30 problems	30 problems
String	40 problems	25 problems	5 problems	30 problems
Mathematics	25 problems	35 problems	35 problems	40 problems
Greedy	30 problems	35 problems	25 problems	30 problems
Brute Force	15 problems	15 problems	10 problems	15 problems

Practice on Online Judges - Level 2

Level 2

Codeforces OJ sheets

The Codeforces OJ sheets phase-2-1, phase-2-2, phase-2-3, phase-2-4 contain B-Div2 problems, and each sheet of them divided into 5 classes of problems (Data Structure - Mathematics - String - Greedy - Brute Force). These sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~120 problems. For the last 2 sheets phase-2-div3-contests that focus on div3-contests (easy contests) and contains ~100 contests, and phase-2-educational-contests, that focus on educational-contests (medium contests) and contains ~100 contests. Finally phase-2-gym-contests that focus on gym-contests that contains ~200 contests.

phase-2-div3-contests		phase-2-educational-contests		phase-2-gym-contests	
100 contests		100 contests		200 contests	
Div3 Contests I	20 Contests	Educational Rounds I	20 Contests	GYM Contests 2	20 Contests
Div3 Contests II	20 Contests	Educational Rounds II	20 Contests	GYM Contests 3 I	25 Contests
Div3 Contests III	20 Contests	Educational Rounds III	20 Contests	GYM Contests 3 II	15 Contests
Div3 Contests IV	20 Contests	Educational Rounds IV	20 Contests	GYM Contests 3 III	30 Contests
Div3 Contests V	20 Contests	Educational Rounds V	20 Contests	GYM Contests 3 IV	30 Contests
				GYM Contests 3 V	30 Contests

Practice on Online Judges - Level 2

Level 2

4 weeks

LeetCode OJ sheets

The LeetCode OJ sheets phase-2-1, phase-2-2, phase-2-3, phase-2-4, phase-2-5, phase-2-6 contain linear and non-linear data structures problems, searching and sorting algorithms, and each sheet of them divided into 6 classes of problems (Array - LinkedList - Stack - Queue - Binary Tree - Heap Tree - HashTable) in addition to (Binary Search - Sorting - Divide and Conquer - Greedy - Bit Manipulation). These sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~200 problems.

phase-2-1	200 problems	phase-2-2	210 problems
Array I	40 problems	Array I	50 problems
Array II	40 problems	Array II	50 problems
Array III	40 problems	Array III	50 problems
Linked List	10 problems	Linked List	30 problems
Stack	50 problems	Stack	10 problems
Queue and Dequeue	20 problems	Queue and Dequeue	20 problems

Practice on Online Judges - Level 2

Level 2

4 weeks

LeetCode OJ sheets

The LeetCode OJ sheets phase-2-1, phase-2-2, phase-2-3, phase-2-4, phase-2-5, phase-2-6 contain linear and non-linear data structures problems, searching and sorting algorithms, and each sheet of them divided into 6 classes of problems (Array - LinkedList - Stack - Queue - Binary Tree - Heap Tree - HashTable) in addition to (Binary Search - Sorting - Divide and Conquer - Greedy - Bit Manipulation). These sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~200 problems.

phase-2-3	170 problems	phase-2-4	180 problems
Recursion	30 problems	Binary Tree I	30 problems
Binary Tree	30 problems	Binary Tree II	30 problems
Heap Tree	30 problems	Binary Tree III	30 problems
Hash Table I	30 problems	Heap Tree	30 problems
Hash Table II	30 problems	Hash Table I	30 problems
Hash Table III	20 problems	Hash Table II	30 problems

Practice on Online Judges - Level 2

Level 2

4 weeks

LeetCode OJ sheets

The LeetCode OJ sheets phase-2-1, phase-2-2, phase-2-3, phase-2-4, phase-2-5, phase-2-6 contain linear and non-linear data structures problems, searching and sorting algorithms, and each sheet of them divided into 6 classes of problems (Array - LinkedList - Stack - Queue - Binary Tree - Heap Tree - HashTable) in addition to (Binary Search - Sorting - Divide and Conquer - Greedy - Bit Manipulation). These sheets were ordered based on the problem difficulty and grouped by the problem type. Finally, each sheet contains ~200 problems.

phase-2-5	190 problems	phase-2-6	200 problems
Binary Search I	35 problems	Binary Search	30 problems
Binary Search II	35 problems	Greedy I	40 problems
Divide and Conquer	20 problems	Greedy II	40 problems
Sorting I	40 problems	Greedy III	40 problems
Sorting II	40 problems	Bit Manipulation I	25 problems
Greedy	20 problems	Bit Manipulation II	25 problems

Practice on Online Judges - Level 2

Level 2

8 weeks

HackerEarth OJ sheets

The HackerEarth OJ sheets phase-2-linear-data-structures, phase-2-non-linear-data-structures, phase-2-algorithms-searching, phase-2-algorithms-sorting, Each sheet contains linear and non-linear data structures problems, in addition to searching and sorting algorithms. These sheets were ordered based on the problem difficulty and each sheet contains ~100 problems.

phase-2-linear-data-structures	110 problems	phase-2-non-linear-data-structures	90 problems
Arrays 1D	65 problems	Binary Tree	10 problems
Arrays Multi-dimensional	20 problems	Binary Search Tree	10 problems
Stacks	25 problems	Heaps / Priority Queues	20 problems
Queues	5 problems	Hash Tables	50 problems
phase-2-algorithms-searching	**120 problems**	**phase-2-algorithms-sorting**	**140 problems**
Linear Search	15 problems	Bubble & Selection & Insertion & Merge	40 problems
Binary Search I	50 problems	Quick & Count & Heap	20 problems
Binary Search II	50 problems	Greedy Algorithms I	40 problems
Ternary Search	5 problems	Greedy Algorithms II	40 problems

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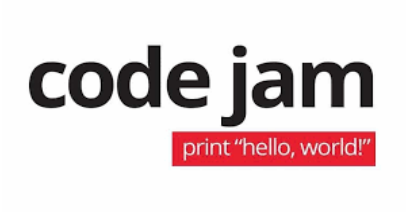
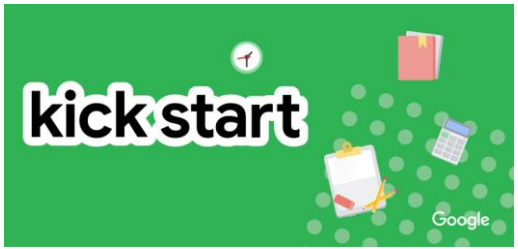
Programming Competitions





Google Competitions

code jam

hash code

kick start

Google Competitions - Code Jam

- Code Jam - Practice Session — March
- Code Jam - Qualification Round — March
- Code Jam - Round 1A — April
- Code Jam - Round 1B — April
- Code Jam - Round 1C — May
- Code Jam - Round 2 — May
- Code Jam - Round 3 — June
- Code Jam - World Finals — August

Google Competitions - Kick Start

- Kick Start - Round A — March
- Kick Start - Round B — April
- Kick Start - Round C — May
- Kick Start - Round D — July
- Kick Start - Round E — August
- Kick Start - Round F — September
- Kick Start - Round G — October
- Kick Start - Round H — November

Google Competitions - Hash Code

- Hash Code - Hub registration opens — November
- Hash Code - Individual registration opens — January
- Hash Code - Registration closes — February
- Hash Code - Online qualification round — February
- Hash Code - Results announced — March
- Hash Code - Final round — April

Facebook Hacker Cup Competition

- Facebook Hacker Cup - Qualification round — June
- Facebook Hacker Cup - Round 1 — June
- Facebook Hacker Cup - Round 2 — July
- Facebook Hacker Cup - Round 3 — August
- Facebook Hacker Cup - Onsite Final — September

ICPC - International College Programming Contest

- Qualification Round in Universities — September
- ECPC Egyptian College Programming Contest — October
- ACPC Arab College Programming Contest — January
- ICPC International College Programming Contest — May

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Python Tutorials

programiz.com/python-programming

docs.python.org/3

geeksforgeeks.org/python-programming-language

tutorialspoint.com/python3

Cpp Tutorials

programiz.com/cpp-programming

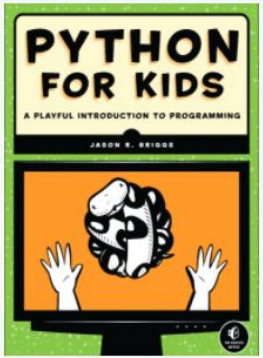
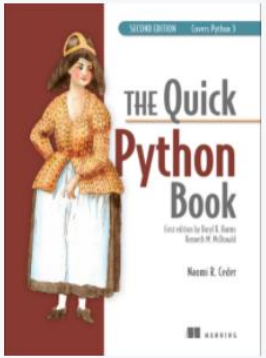
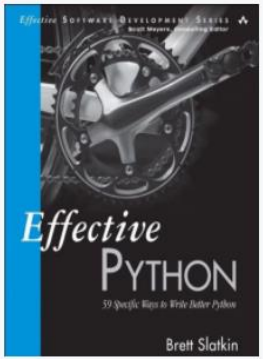
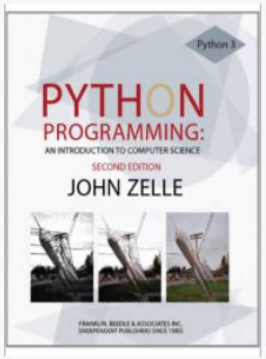
cplusplus.com/doc/tutorial

geeksforgeeks.org/c-plus-plus

tutorialspoint.com/cplusplus

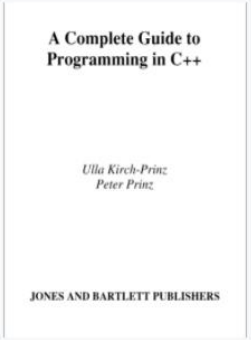
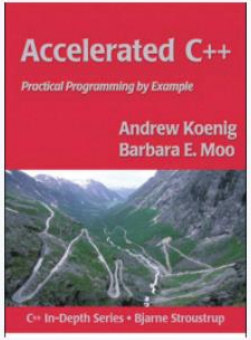
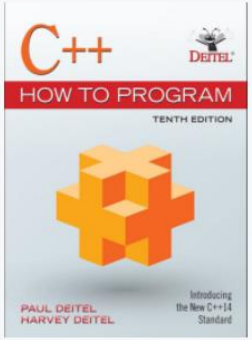
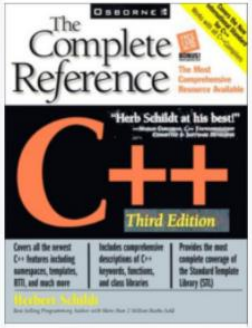
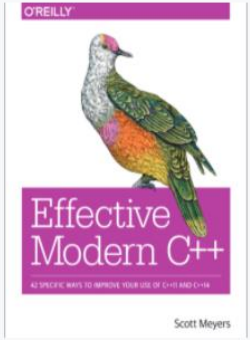
Python References

Textbooks: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

Python for Kids, Jason R. Briggs	The Quick Python Book Naomi R. Ceder	Think Python, Allen B. Downey
		
Effective Python, Brett Slatkin	**Python Programming, John Zelle**	**Python3 TutorialsPoint**
		

Cpp References

Textbooks: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

A Complete Guide to Programming in Cpp, Ulla Kirch Prinz	Accelerated Cpp, Andrew Koenig and Barbara E. Moo	Cpp How to Program, Paul Deitel
		
Cpp The Complete Reference, Herbert Schildt	**Object-Oriented Programming in C++, Robert Lafore**	**Effective Modern Cpp, Scott Meyers**
		

Data Structures and Algorithms Analysis Tutorials

programiz.com/dsa

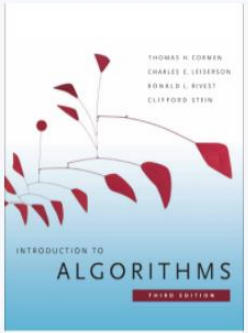
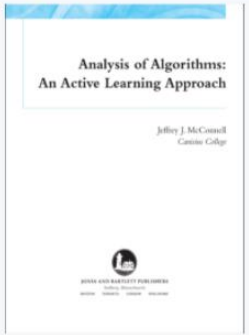
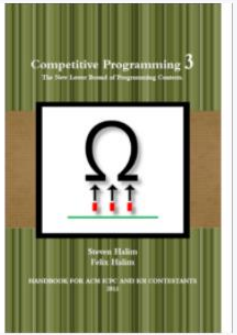
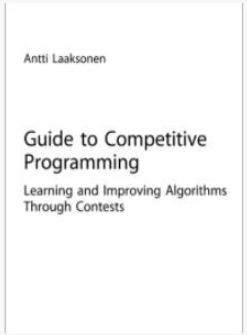
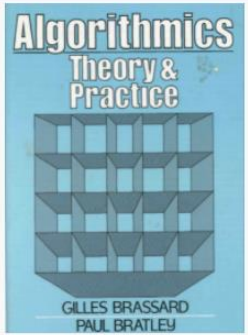
hackerearth.com/practice/data-structures
hackerearth.com/practice/algorithms

geeksforgeeks.org/data-structures
geeksforgeeks.org/fundamentals-of-algorithms

tutorialspoint.com/data_structures_algorithms

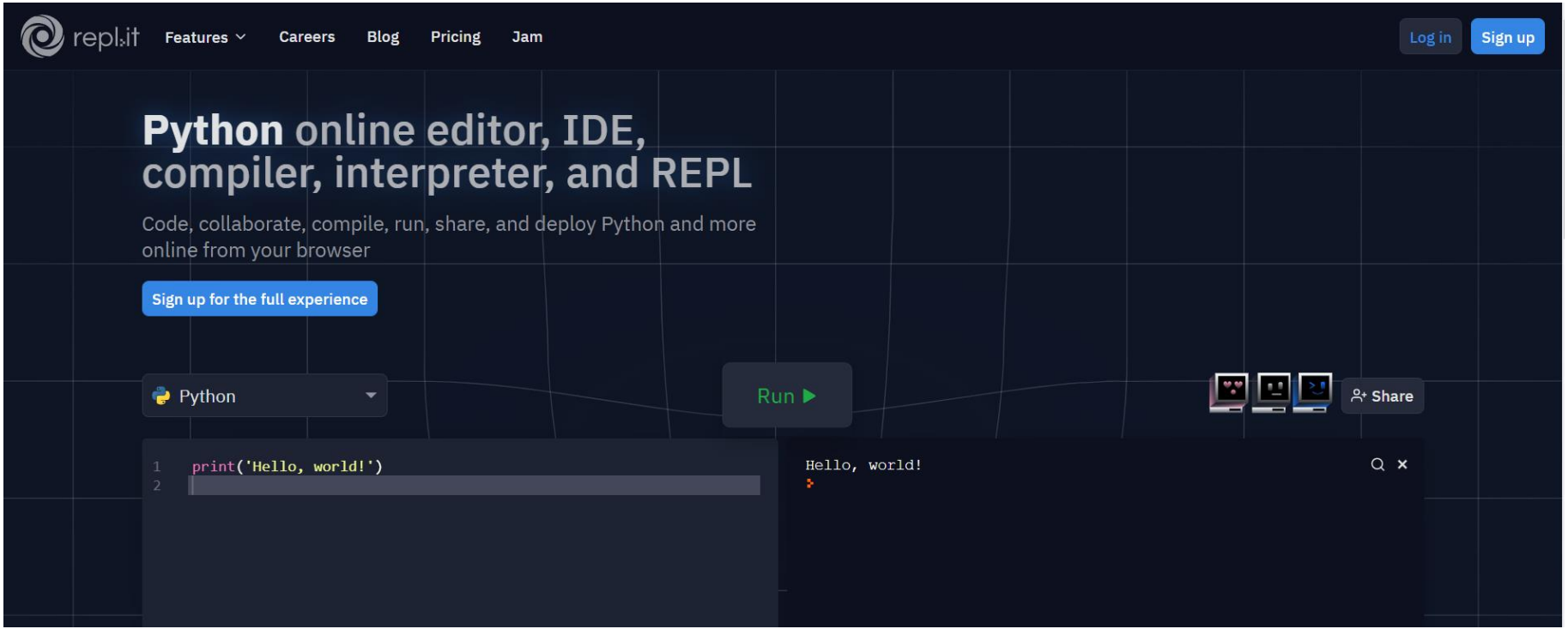
Data Structures and Algorithms Analysis References

Textbooks: github.com/cs-MohamedAyman/Data-Structures-and-Algorithms-Analysis-Training

Introduction to Algorithms, Thomas H. Cormen	Data Structures and Algorithms Annotated Reference, Granville Barnett	Analysis of Algorithms An Active Learning Approach, Jeffrey J. McConnell
		
Competitive Programming 3, Steven Halim	Guide to Competitive Programming, Antti Laaksonen	Fundamental of Algorithmics, Gilles Brassard and Paul Bartley
		

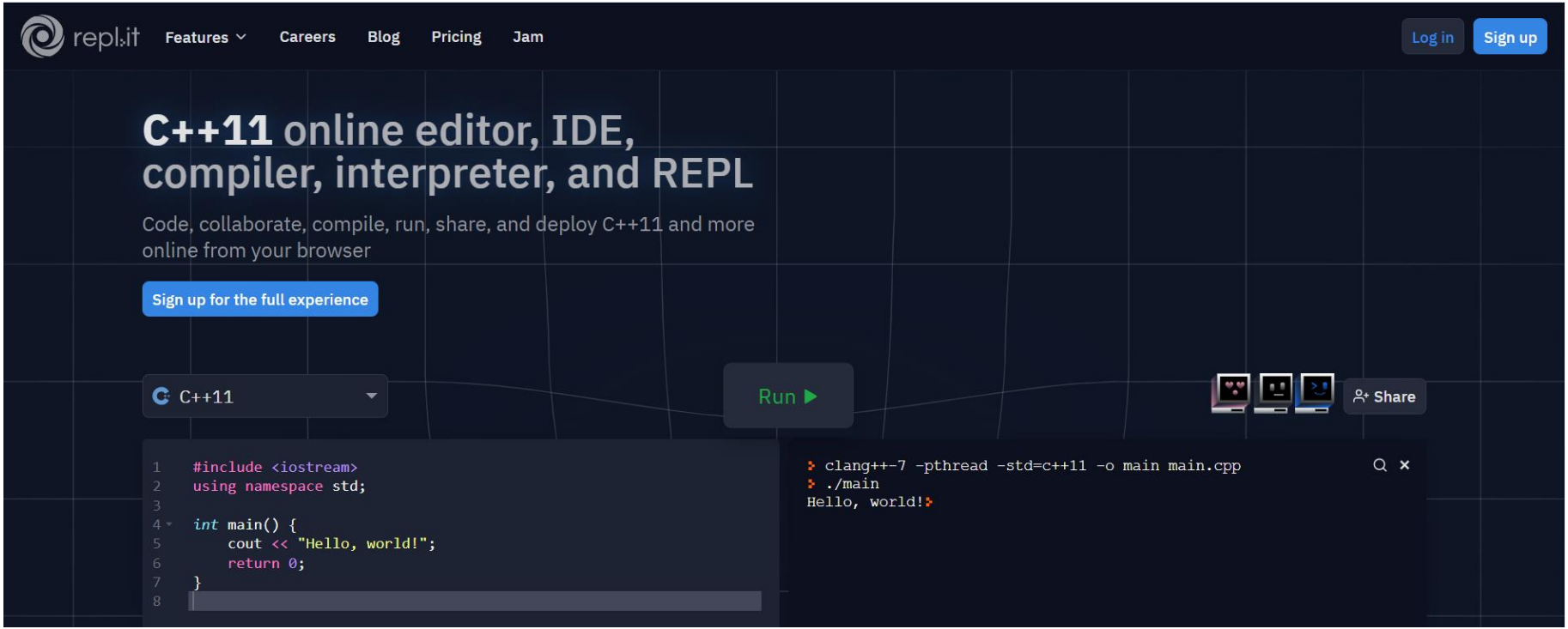
Python Online Interpreters

repl.it online interpreter: repl.it/languages/python3



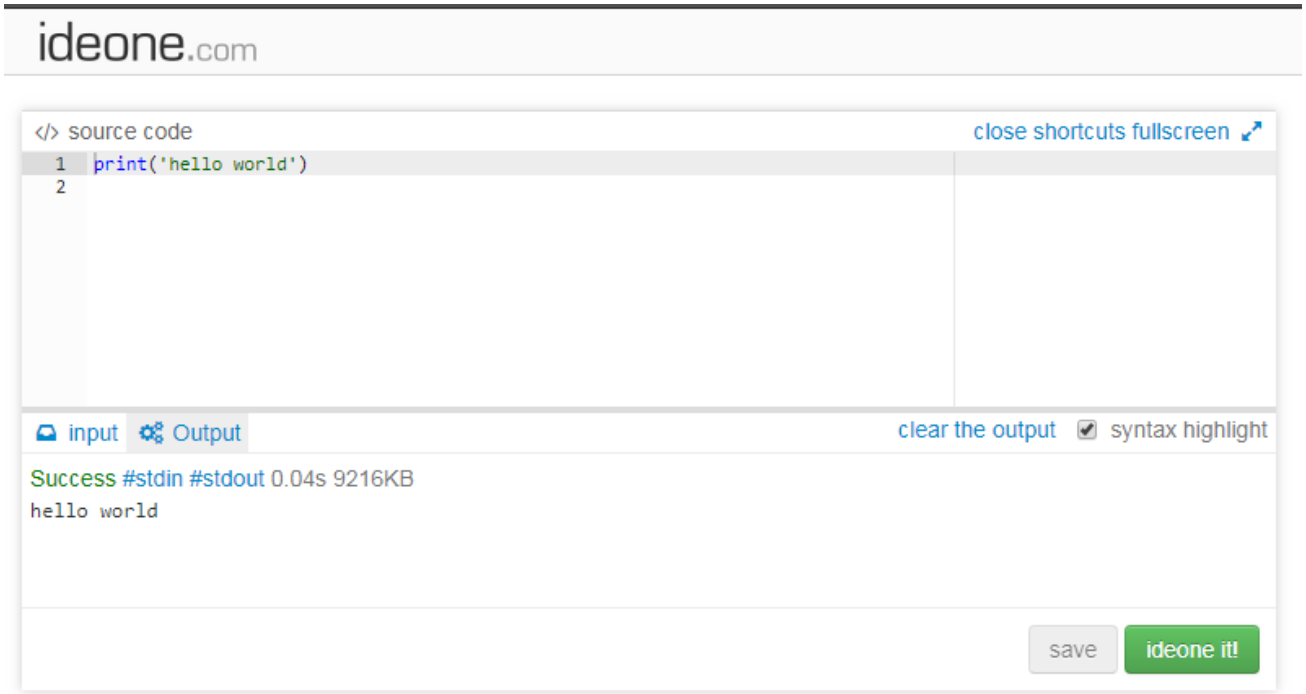
Cpp Online Compilers

repl.it online compiler: repl.it/languages/cpp



Python Online Interpreters

ideone online interpreter: ideone.com



Cpp Online Compilers

ideone online compiler: ideone.com

ideone.com

</> source code close shortcuts fullscreen

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      cout << "Hello World";
6      return 0;
7  }
```

input Output clear the output syntax highlight

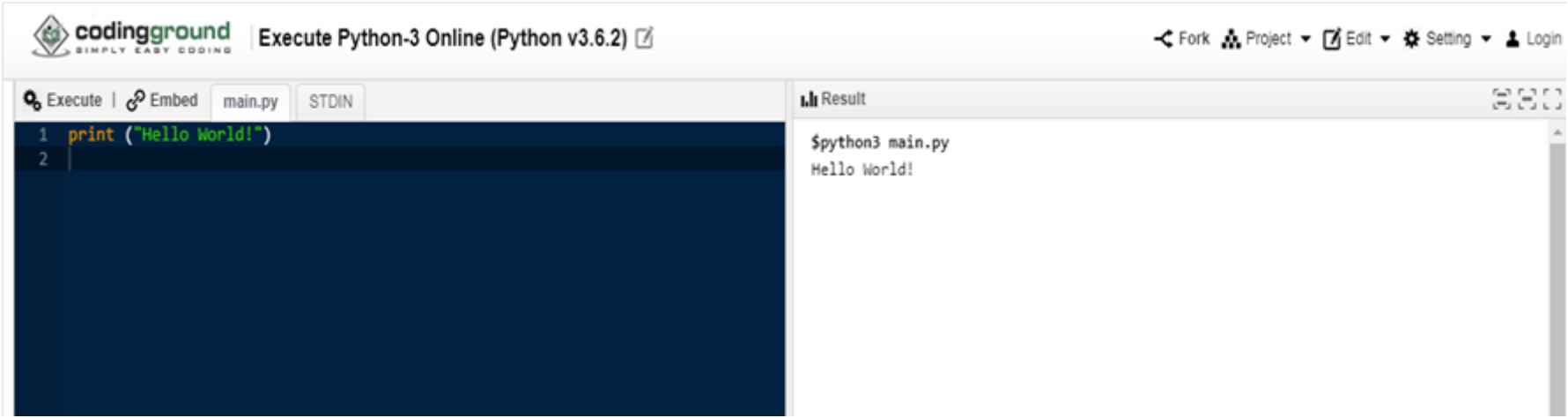
Success #stdin #stdout 0s 4780KB

```
Hello World
```

save ideone it!

Python Online Interpreters

Tutorialspoint online interpreter: tutorialspoint.com/execute_python3_online.php



Cpp Online Compilers

Tutorialspoint online compilers: tutorialspoint.com/compile cpp online.php

Lecture Agenda

- ✓ Section 1: Introduction to Training
- ✓ Section 2: Training Content and Timeline
- ✓ Section 3: Practice on Online Judges
- ✓ Section 4: Programming Competitions
- ✓ Section 5: Tutorials and References

Section 6: Online Courses

Python Coursera Specializations

Specializations: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

Introduction to Computer Science and Programming Specialization by University of London	Computational Thinking & Block Programming in K-12 Education Specialization by University of California San Diego	Introduction to Scripting in Python Specialization by Rice University
Python 3 Programming Specialization by University of Michigan	Fundamentals of Computing Specialization by Rice University	Programming in Python: A Hands-on Introduction Specialization by Codio

Cpp Coursera Specializations

Specializations: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

Introductory C Programming Specialization by Duke University	Computational Thinking with Beginning C Programming Specialization by University of Colorado Boulder	Coding for Everyone: C and C++ Specialization by University of Californ Specialization by University of California Santa Cruz
Programming in C++: A Hands-on Introduction Specialization by Codio	Accelerated Computer Science Fundamentals Specialization by University of Illinois at Urbana-Champaign	Competitive Programming by Moscow Institute of Physics and Technology

Programming Language Playlists

Playlists: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

freeCodeCamp.org Playlists	edureka! Playlists	thenewboston Playlists	Tutorials Point (India) Ltd. Playlists	CodeWithHarry Playlists
Telusko Playlists	ProgrammingKnowledge Playlists	Simplilearn Playlists	Derek Banas Playlists	Clever Programmer Playlists

Programming Language Playlists

Playlists: github.com/cs-MohamedAyman/Programming-Languages-and-Object-Oriented-Training

Naresh i Technologies Playlists	The Net Ninja Playlists	Intellipaat Playlists	Tech With Tim Playlists	easytuts4you Playlists
by The Cherno Playlists	GeeksforGeeks Playlists	Geeky Shows Playlists	Caleb Curry Playlists	Sundeep Saradhi Kanthety Playlists

Data Structures and Algorithms Specializations

Specializations: https://github.com/cs-MohamedAyman/Data-Structures-and-Algorithms-Analysis-Training

Introduction to Discrete Mathematics for Computer Science Specialization by University of California San Diego	Discrete Mathematics by Shanghai Jiao Tong University	Accelerated Computer Science Fundamentals Specialization by University of Illinois at Urbana-Champaign
Algorithms Specialization by Stanford University	Competitive Programming by Moscow Institute of Physics and Technology	Data Structures and Performance by University of California San Diego

Data Structures and Algorithms Specializations

Specializations: https://github.com/cs-MohamedAyman/Data-Structures-and-Algorithms-Analysis-Training

Geometric Algorithms by EIT Digital	Algorithms by Princeton University	Data Structures and Algorithms Specialization by University of California San Diego
Computational Geometry by Saint Petersburg State University	Computer Science: Algorithms, Theory, and Machines by Princeton University	Algebra & Algorithms by Moscow Institute of Physics and Technology

Data Structures and Algorithms Playlists

Playlists: github.com/cs-MohamedAyman/Data-Structures-and-Algorithms-Analysis-Training

MIT OpenCourseWare Playlists	Tutorials Point (India) Ltd Playlists	nptelhrd Playlists	Neso Academy Playlists	mycodeschool Playlists
Gate Lectures by Ravindrababu Ravula Playlists	Gate Smashers Playlists	Education 4u Playlists	Jennys lectures CS-IT NET&JRF Playlists	Easy Engineering Classes Playlists

Data Structures and Algorithms Playlists

Playlists: github.com/cs-MohamedAyman/Data-Structures-and-Algorithms-Analysis-Training

KNOWLEDGE GATE Playlists	GeeksforGeeks Playlists	Sundeep Saradhi Kanthety Playlists	5 Minutes Engineering Playlists	Tushar Roy - Coding Made Simple Playlists
Back To Back SWE Playlists	Simple Snippets Playlists	TheTrevTutor Playlists	Unacademy Computer Science Playlists	WilliamFiset Playlists

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