

Guide to Competitive Programming

Learning and Improving Algorithms Through Contests

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Undergraduate Topics in Computer Science

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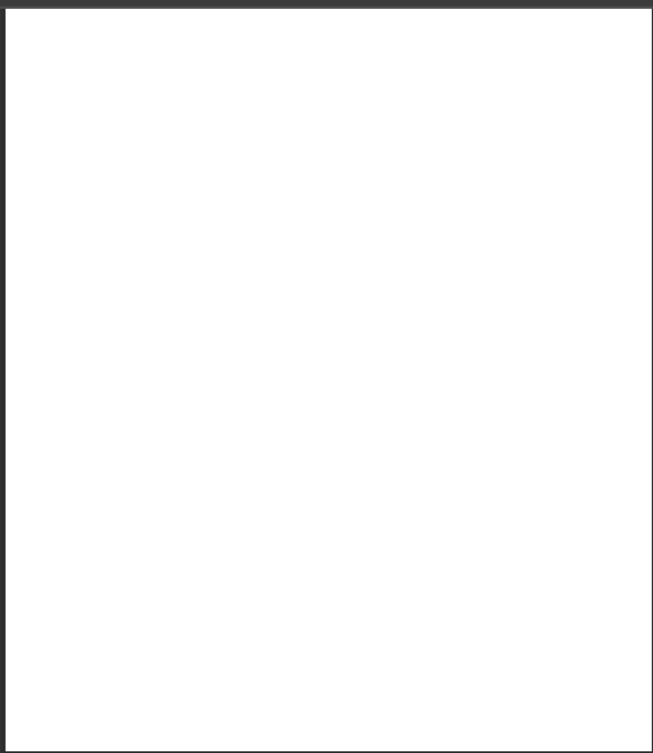
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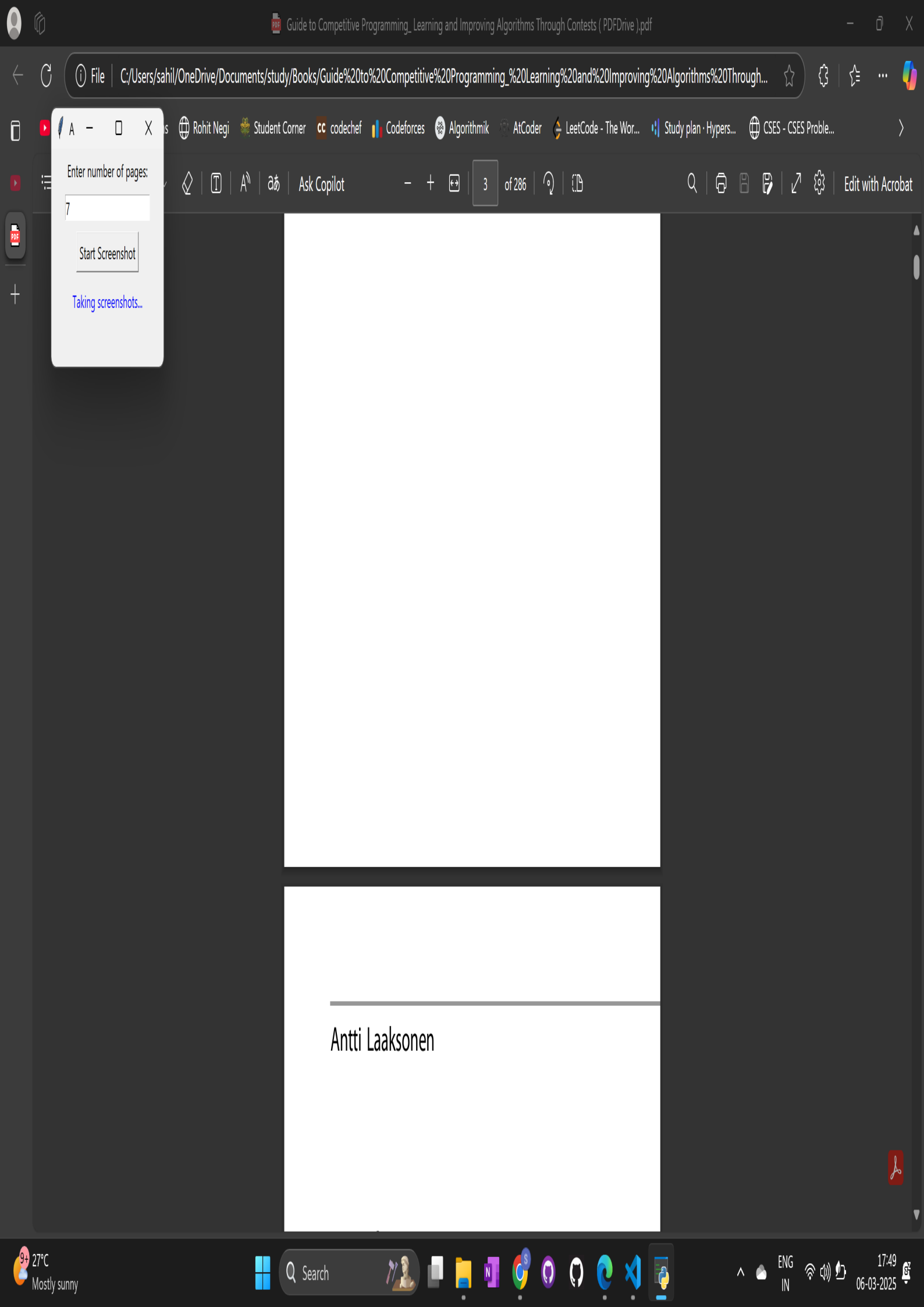
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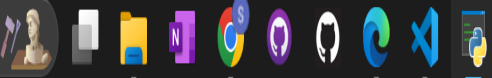
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Preface

The purpose of this book is to give you a comprehensive introduction to modern competitive programming. It is assumed that you already know the basics of programming, but previous background in algorithm design or programming contests is not necessary. Since the book covers a wide range of topics of various difficulty, it suits both for beginners and more experienced readers.

Programming contests already have a quite long history. The *International Collegiate Programming Contest* for university students was started during the 1970s, and the first *International Olympiad in Informatics* for secondary school students was organized in 1989. Both competitions are now established events with a large number of participants from all around the world.

Today, competitive programming is more popular than ever. The Internet has played a significant role in this progress. There is now an active online community of competitive programmers, and many contests are organized every week. At the same time, the difficulty of contests is increasing. Techniques that only the very best participants mastered some years ago are now standard tools known by a large number of people.

Competitive programming has its roots in the scientific study of algorithms. However, while a computer scientist writes a proof to show that their algorithm works, a competitive programmer *implements* their algorithm and submits it to a contest system. Then, the algorithm is tested using a set of test cases, and if it passes all of them, it is accepted. This is an essential element in competitive programming, because it provides a way to *automatically* get strong evidence that an algorithm works. In fact, competitive programming has proved to be an excellent way to learn algorithms, because it encourages to design algorithms that really work, instead of