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Explain-It-Back 7

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Explain dynamic programming to a biology major—what it is, how it works, and why it is valuable.

Dear Friend,

Dynamic Programming is simply the process of storing the results of sub problems, found through recursively calling an algorithm, so that there would be no need to recompute them if they are used again later. Think of it like this: When we catch a bacterial disease, your B-Cells engulf the pathogen and display its antigens. T-Cells with the corresponding receptor then must randomly find the matching B-Cell. Here processes occur. The first process involves constant production of antibodies in order to fight the pathogen. This repeated process is like recursion in the case of dynamic programming. Small pieces of a solution to a problem are found through the same repeated process. Next, the T-Cell signals for the development of a Memory T-Cell. This cell is produced in case the pathogen is re-emerges in the body. This time you can skip the process of having a B-Cell engulf the pathogen and wait for a T-Cell to randomly find its correct antigen. You already have the T-Cell ready to produce the antibodies to quickly eradicate the disease. This is what makes dynamic programming valuable. It saves the solutions to the sub problems. When they need to be revisited for their solution, they will no longer need to recompute the entire process. This dramatically reduces the amount of time to solve the problem, or finish the program. This method to optimize code turns the recursion method which has a high time complexity of an exponential increase with constant increment of data into a linear time which grows far more consistently with the increase in data.

