

1-1-2021

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Technical Report: UTEP-CS-21-08

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### Recommended Citation

Kreinovich, Vladik; Kosheleva, Olga; and Servin, Christian, "How To Guarantee Fairness Of Grading Without Sacrificing Privacy?" (2021). *Departmental Technical Reports (CS)*. 1541.

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УДК

## HOW TO GUARANTEE FAIRNESS OF GRADING WITHOUT SACRIFICING PRIVACY?

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### **Abstract**

Everyone – instructors and students – want to make sure that grading of each test is fair, that the only thing that determines the students' grade is their level of knowledge, that different students get the same penalty for the same mistake, irrespective of their gender, of their past grades, of their behavior in the class, of how many classes they missed, etc. How to help instructors achieve this goal? How to make sure that students are convinced that grading was indeed fair? In this paper, we describe possible measures: anonymous submissions, forming (and posting for all the student to see) an exact grading algorithm, and posting anonymized versions of all the solutions submitted by all the students. To implement these measures, it is necessary to have a centralized computer system that will generate random numbers or random emails for students to submit their tests – but such a system is reasonably easy to design.

**Keywords:** *test grading, privacy anonymity, fairness.*

### **FORMULATION OF THE PROBLEM**

*Students want grading to be fair.* Students want to be sure that grading was fair, that for the same mistake all the students who made this mistake were penalized the exact same number of points, irrespective of their gender, their behavior in class, their previous grades, etc.

*Why is grading not always fair?* There probably are cases when instructors are explicitly prejudiced and grade, e.g., female students easier (or harsher) than male ones.

However, in our experience, the main reason why grading is not always fair is more on the implicit level.

Let us give a simple example. Two students submit the test. The first student attended all the lectures, turned in all his home assignments on time, got good grades on all the previous tests. We know that this is a hard-working student, we know that he knows the material, so a natural tendency is to look at his/her test results perfunctorily and, unless we notice some errors, give this student a well-deserved Excellent grade. The second student skipped many classes, did not turn in many homework assignments, did not do well on the previous tests. At first glance, his/her test may look good, but naturally, you do not want to give this student an excellent grade without further checking: if you can find some flaw in his/her test, this would be a good pedagogical lesson to others -- that they better study all semester long and not just right before the test. So you find some flaws and give this student a Good grade. This all sounds reasonable – but what may have happened (and what sometimes happens) is that the first student also had some minor flaws, but you did not notice them because you did not review his/her test that attentively. The result is unfair: for the same minor mistake(s), one student gets Excellent, the other student gets only Good. Students will notice that, and they will not be happy.

Moreover, one such episode, and many students become convinced that the professor is unfair to them. Not only this belief lowers their morale, it also prevents them from studying well: what is the purpose of studying well if the grades are given not based on knowledge, but based – as they think – on who brown-noses the instructor more.

*Problem.* How can we make sure that our grading is fair? How can we convince the students that grading was fair?

*Need for privacy makes this task more difficult.* In the old days, when instructors could simply post all the students' grades and even post their solutions – with names – and/or show them to the whole class, comparison was easier. However, nowadays, in many countries, there are privacy restrictions: a student is not supposed to know anyone else's grade.

So what can we do?

### **WHAT WE CAN DO BEFORE (AND DURING) GRADING**

*How is a similar problem solved for refereeing papers?* Instead of attempting to re-invent the wheel, let us look for other situations when there is a need for fairness and for privacy. Actually, we all know such situations – these are situations when we referee papers or grant proposals. In these situations, there are known ways to guarantee fairness, the main ones are anonymous and doubly anonymous refereeing.

In anonymous refereeing, the author of the refereed paper does not know who is refereeing his/her paper. Unfortunately, this is not possible for grading tests: there are very few people who grade, the instructor and maybe a few teaching assistants; there is no way to make it really anonymous. From this viewpoint, doubly anonymous refereeing, when the name of the author is not known to the referee, has more promise: this can be done.

Let us make tests anonymous. In many cases – especially now that most teaching is online anyway – tests are submitted online. So, instead of sending them via their regular recognizable emails, students should be assigned special randomly selected additional emails for submitting tests. This way, the instructor does not know who wrote which test. The instructor then send the grade (and the detailed information about possible mistakes because of which this grade was not perfect – if it was not

perfect) to the same email, and also submits the grades to an automatic system that matches this grade to the corresponding student.

Ideally, this additional email should be different for each test – to prevent the grader from being biased by the same student’s grade on the previous tests.

A similar arrangement can be made during a face-to-face test: students are assigned random numbers that they place on their tests, and then all the grades (and all mistakes) are posted together with these numbers, so that each student can find out how well he/she did on the test. For a face-to-face test, this is not a perfect solution: an instructor can often recognize the student by his/her handwriting. This can be avoided if all students type their answers and send them by email – or to a printer.

*Similar anonymity arrangement can help with students’ questions.* A similar anonymity can be used for students to ask questions. In general, instructors welcome questions from students. However, if a student asks a naïve question about the class material the day before the exam – a question showing that the student is not yet ready for the test – this does not improve the student’s standing with the instructor, and may affect the student’s grades, or – if grading is anonymous – the chance of this instructor later writing a good recommendation letter for the student. Because of this worry, students are often reluctant to ask questions – and this hinders their performance.

A natural way to resolve this problem is to give, to a student who wants to ask a question, a special email – intended specifically for this question.

*How to make sure that this anonymity does not lead to an abuse?* When emails are anonymous, what prevents an unhappy student from using this anonymity to insult an instructor? Well, there is a central system that knows who is who. If a student sends an insulting message instead of a question, the instructor can complain to this central

system, and the system will forward this complaint – and the actual name of the abusive student – to the corresponding authorities.

*Important issue: need for a precise grading algorithm.* The best way to avoid the impression of unfairness is to make sure that the same number of points is taken off for the same mistake. To make sure that this is the case, a good idea is to write down how many points are taken off for each mistake.

Of course, it is not possible to predict before the test what kind of mistakes students will make. There are some common mistakes, which an experienced instructor already knows from teaching this class before – but there are always additional mistakes. Besides, if last time the class was taught, some mistake was common, the next time when the instructor teaches this class, he/she will naturally emphasize the need to avoid this mistake – and this emphasis will make this mistake not as common as it was last time.

Since we cannot predict all possible mistakes before the test, we need to fill in the list of mistakes as we grade the tests – we see a new mistake, we think of how many points to take off for this mistake, and we add this information to the table.

This not only helps to make grading more fair, it makes grading easier: we do not need to keep in mind and/or to re-decide again and again how many points to take off for each mistake – it is all in the table.

A good idea is to *publicize* this table after the tests are graded, so that the students will be able to check their own tests and make sure that they were graded according to the general algorithm.

This brings us to the next topic: what can we do after grading?

## WHAT CAN WE DO AFTER GRADING

*Why do we need to do anything additional after grading?* At first glance, it may seem that the above-described measures – in particular, posting the grading algorithm in the form of a table of possible mistakes and resulting penalties -- takes care of perception of fairness: a student gets his/her graded test back, checks the grade for each of the problem against the posted table, and thus gets reassured that the grading of his/her test was fair.

True, but how will the student know that others were graded fairly? Maybe the instructor was taken off all the corresponding points from him/her, but got lenient on other students – e.g., those who were brown-nosing to this instructor?

To avoid this perception, the best solution is maximal possible openness. Why not post all the (anonymized) tests with their grades? To make sure that the instructor does not post the test with the correct grade while submitting an inflated grade to the system, the system should report, e.g., the exact arithmetic average of all submitted grades for this test to all the students – this way, an interested student can always compare this average with the average of the posted grades. Clearly, the instructor cannot submit a grade which is lower than what the student deserves according to the table – this unfairly punished student will notice it and complain. So, the only way an instructor can “cheat” is by submitting a higher grade for some students – but this would increase the overall average and will, thus, be noticed.

The posting of all the students’ tests can also help the students find omissions – like the one we mentioned earlier, when the instructor misses a mistake: if all the test solutions by all students are posted, there is a good chance that someone will notice a mistake even if the instructor missed it. This is not because students are vicious, no, the

reason is different: students tend to look at perfect and almost perfect tests to understand how the problem was supposed to be solved. So, if a paper is posted with an Excellent grade, quite a few students will study it very attentively – and, with a good chance, find a mistake if there was a one.

*Let us hope.* Let us hope that all this will make grading more fair, and will make students convinced – without the need to violate privacy -- that the grading was indeed fair.



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