

# Introduction to Database Systems

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## Assignment 4b

### 1 Query

For every department, calculate the average number of 'S' grades earned by students within that department. Only consider students with number of s grades greater than 2

```
explain select d.deptId,d.name,avg(dep_stud.cg) as avg_numof_sgrade
from department as d,
(
    select s.deptNo as dn,s.rollNo as sr, count(e.grade) as cg
    from student as s, enrollment as e
    where s.rollNo=e.rollNo and e.grade ="S"
    group by s.deptNo,s.rollNo
    having count(e.grade)>2
) as dep_stud
where d.deptId =dep_stud.dn
group by d.deptId;
```

### 2 execution plan without indexes

	id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
►	1	PRIMARY	d	<small>NULL</small>	index	PRIMARY,hod	PRIMARY	82	<small>NULL</small>	20	100.00	<small>NULL</small>
	1	PRIMARY	<derived2>	<small>NULL</small>	ref	<auto_key0>	<auto_key0>	83	academic_insti.d.deptId	13	100.00	<small>NULL</small>
	2	DERIVED	e	<small>NULL</small>	ALL	PRIMARY	<small>NULL</small>	<small>NULL</small>	<small>NULL</small>	13586	10.00	Using where; Using temporary
	2	DERIVED	s	<small>NULL</small>	eq_ref	PRIMARY,deptNo	PRIMARY	22	academic_insti.e.rollNo	1	100.00	<small>NULL</small>

**Observation:** for table e (third row) using 13,586 rows and the filter percentage is 10 percent, which means it accessing all rows.

### 3 Query using index

```
create index idx_eroll on enrollment(grade);

explain select d.deptId,d.name,avg(dep_stud.cg) as avg_numof_sgrade
from department as d,
(
select s.deptNo as dn,s.rollNo as sr, count(e.grade) as cg
from student as s, enrollment as e
where s.rollNo=e.rollNo and e.grade ="S"
group by s.deptNo,s.rollNo
having count(e.grade)>2
) as dep_stud
where d.deptId =dep_stud.dn
group by d.deptId;

drop index idx_eroll on enrollment;
```

### 4 Execution plan after using index

	id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
►	1	PRIMARY	academic_insti	HULL	index	PRIMARY,hod	PRIMARY	82	HULL	20	100.00	HULL
	1	PRIMARY	academic_insti	HULL	ref	<auto_key0>	<auto_key0>	83	academic_insti.d.deptId	14	100.00	HULL
	2	DERIVED	e	HULL	ref	PRIMARY,idx_eroll	idx_eroll	11	const	1492	100.00	Using index; Using temporary
	2	DERIVED	s	HULL	eq_ref	PRIMARY,deptNo	PRIMARY	22	academic_insti.e.rollNo	1	100.00	HULL

**Observation:** after using an index for the grade it only checks 1,492 rows and now the filter is 100% and deptId increased from 13 to 14 but overall rows access decreased thus Index on grade improved the performance. previous query grade as no index and checks all rows now through it retrieve information fast