INSTRUCTIONS:
Fill out the hazard analysis and risk assessment below.
HA-001 should be for the lane departure warning function as discussed in the lecture.
HA-002 should be for the lane keeping assistance function as discussed in the lecture.
Then come up with your own situations and hazards for the lane assistance system. Fill in the HA-003 and HA-004 rows.
When finished, export your spreadsheet as a pdf file so that a reviewer can easily see your work.

Hazard ID	Situational Analysis					
	Operational Mode	**Operational Scenario**	**Environmental Details**	**Situation Details**	**Other Details (optional)**	**Item Usage (function)**
HA-001	OM03 - Normal driving	OS04 - Highway	EN06 - Rain (slippery road)	SD02 - High speed		IU01 - Correctly used
HA-002	OM03 - Normal driving	OS03 - Country Road	EN01 - Normal conditions	SD02 - High speed		IU02 - Incorrectly used
HA-003	OM03 - Normal driving	OS03 - Country Road	EN04 - Snowfall (degraded view)	SD03 - Normal acceleration		IU02 - Incorrectly used
HA-004	OM03 - Normal driving	OS04 - Highway	EN01 - Normal conditions	SD02 - High speed	Car is entering construction site area on highway, lanes merge together and change lane line color to yellow.	IU01 - Correctly used

	Hazard Identification			
Situation Description	**Function**	**Deviation**	**Deviation Details**	**Hazardous Event (resulting effect)**
Normal driving on a highway during rain (slippery road) with high speed and correctly used system.	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV04 - Actor effect is too much	The LDW function applies an oscillating torque with very high torque (above limit).	EV00 - Collision with other vehicle
Normal driving on country roads during normal conditions with high speed.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 - Function always activated	LKA function is always activated.	EV00 - Collision with other vehicle
Nomal driving on country roads during snowfall (degraded view) with normal acceleration.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV19 - Sensor detection is wrong	Camera sensor is not able to find correct lane position because of snow.	EV04 - Car comes off the road
Nomal driving on highway during normal conditions with high speed.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV19 - Sensor detection is wrong	Camera sensor gets does not detect lane merging situation at construction site and therefor keeps on following mergin lane without precaution.	EV-02 - Side collision with other traffic

				Hazard
Event Details	**Hazardous Event Description**	**Exposure (of situation)**	**Rationale (for exposure)**	**Severity (of potential harm)**
High haptic feedback can affect driver's ability to steer as intended. The driver could lose control of the vehicle and collide with another vehicle or with road infrastructure.	The LDW function applies too high an oscillating torque to the steering wheel (above limit).	E3 - Medium probability	Driving on a highway during rain can happen once a month or more depending on driver's location.	S3 - Life-threatening or fatal injuries
Driver treats the function as if it were meant for fully autonomous driving and therefore can't react on critical situations.	The LKA function is always activated and the driver stops focusing on driving the car.	E2 - Low probability	The driver is on a country road and misusing the system.	S3 - Life-threatening or fatal injuries
Driver does not react fast enough to prevent car from leaving road, because of incorrect lane detection.	LKA mixes up lane line with edge of road / pavement due to fallen snow.	E2 - Low probability	Driving on country roads during snowfall only occurs a few times a year.	S3 - Life-threatening or fatal injuries
Driver does not see exsitant car on lane, ego lane gets merged into.	LKA steers seemlessly into merged lane provoking collision with vehicles within adjacent lane.	E4 - High probability	Driving on highway and encountering construction sites occurs in almost every drive on average.	S3 - Life-threatening or fatal injuries

dous Event Classification			Determination of ASIL and Safety Goals	
Rationale (for severity)	**Controllability (of hazardous event)**	**Rationale (for controllability)**	**ASIL Determination**	**Safety Goal**
Driver is traveling at high speed.	C3 - Difficult to control or uncontrollable	Overreaction of wheel's vibration is very distracting and even suprising, so the most drivers won't be able to avoid harm..	C	The oscillating steering torque from the LDW function shall be limited.
Driver is traveling at high speed.	C3 - Difficult to control or uncontrollable	LKA is always on, driver could take hands off the wheel and therefore looses control entirely.	B	LKA function shall be time limited and the additional steering torque shall end after a given timer interval so that the driver can not misuse the system for autonomous driving.
Coming off the road can imply hitting static objects or pedestrians.	C2 - Normally controllable	Driving at normal speed, driver can react when vehicle gets to close to edge of the road.	A	LKA function has to be deactivated if camera sensor is not able to detect lanes correctly.
Driver is traveling at high speed.	C3 - Difficult to control or uncontrollable	Driving at high speed and encountering a new situation (construction site, merging lanes, adjacent cars) requires fast and appropriate evaluation and reaction.	D	LKA has to be sensible for different coloring of lane lines, reliably detect and react on merging lanes in advance.