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. F
When finished, export your spreadsheet as a pdf file so that a reviewer can easily see

Hazard ID	Situational A			
	Operational Mode	**Operational Scenario**	**Environmental Details**	**Situation Details**
HA-001	OM03 - Normal driving	OS04 - Highway	EN01 - Normal conditions	SD02 - High speed
HA-002	OM03 - Normal driving	OS03 - Country Road	EN01 - Normal conditions	SD02 - High speed
HA-003	OM03 - Normal driving	OS02 - City Road	EN07 - Snow (slippery road)	SD02 - High speed
HA-004	OM03 - Normal driving	OS01 - Any Road	EN09 - N/A	SD06 - High braking

Hazard ID		HA-001	HA-002	HA-003
onal Analysis	**Operational Mode**	OM03 - Normal driving	OM03 - Normal driving	OM03 - Normal driving
	Operational Scenario	OS04 - Highway	OS03 - Country Road	OS02 - City Road
	Environmental Details	EN01 - Normal conditions	EN01 - Normal conditions	EN07 - Snow (slippery road)
	Situation Details	SD02 - High speed	SD02 - High speed	SD02 - High speed
	Other Details (optional)			
	Item Usage (function)	IU01 - Correctly used	IU02 - Incorrectly used	IU01 - Correctly used

Situati	**Situation Description**	Normal driving on Highway during rain (slippery conditions) with high speed and correctly used system	Normal driving on country roads during normal conditions with high speed, the driver is misusing the lane keeping assistance function (as an autonomous function)	Normal driving on City Road coverd with snow (slippery conditions) with low speed and correctly used system
Hazard Identification	**Function**	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
	Deviation	DV04 Actor effect is too much	DV03 Function always activated	DV11 - Actor effect is wrong
	Deviation Details	The LDW function applies an oscillating torque with very high torque (above limit).	the lane keeping assistance function is always activate	The LDW function applies false oscillating torque frequantly.
	Hazardous Event (resulting effect)	EV00 - Collision with other vehicle	EV00 - Collision with other vehicle	EV03 - Car spins out of control
	Event Details	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.	lane keeping assistance was always on and had no time limit, driver hands may NOT be on the wheel at high speeds, a vehicle accident would not be controllable.	lanes are not clear on icey road, which fires false LDWs
	Hazardous Event Description	The LDW function applies too high an oscillating torque to the steering wheel (above limit).	The lane keeping assistance function was NOT meant for fully autonomous driving.	the LDW function applies wrong oscillating torque to steering wheel
Hazardous Event Classification	**Exposure (of situation)**	E3 - Medium probability	E2 - Low probability	E1 - Very low probability
	Rationale (for exposure)	Driving On slippary Highway (because of rain) is very frequant in winter (or everyday in tropical weather)	(on Highway with Highspeed + Misuse system) combination probably does not happen often	once in a year or less.
	Severity (of potential harm)	S3 - Life-threatening or fatal injuries	S3 - Life-threatening or fatal injuries	S3 - Life-threatening or fatal injuries
	Rationale (for severity)	Highway Speed limits are relativly high, and crashing on high speed is life-theatening	Crash on high speed is fatal	on high speed, car crash is fataly harmful
	Controllability (of hazardous event)	C3 - Difficult to control or uncontrollable	C3 - Difficult to control or uncontrollable	C3 - Difficult to control or uncontrollable

	Rationale (for controllability)	less than 90% of all drivers were able to avoid harm in that setuation	less than 90% of all drivers were able to avoid harm in that setuation	less than 90% of drivers can control slippary car on icey road
Determination of ASIL and Safety	**ASIL Determination**	ASIL C	ASIL B	ASIL A
	Safety Goal	The oscillating torque from the Lane Departure Warning (LDW) function shall be limited.	The lane keeping assistance function shall be time limited and the additional steering torque shall end after a given time interval so that the driver cannot misuse the system for autonomous driving.	The oscillating torque from the Lane Departure Warning (LDW) function shall stop when driver is trying to control the car in bad weather conditions.

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Other Details (optional)	Item Usage (function)	Situation Description	Function
	IU01 - Correctly used	Normal driving on Highway during rain (slippery conditions) 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
	IU02 - Incorrectly used	Normal driving on country roads during normal conditions with high speed, the driver is misusing the lane keeping assistance function (as an autonomous function)	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane
	IU01 - Correctly used	Normal driving on City Road coverd with snow (slippery conditions) with low speed and correctly used system	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
	IU01 - Correctly used	Normal driving on Any roads during Any conditions with high Braking, the driver correctly using the lane keeping assistance function.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane

HA-004
OM03 - Normal driving
OS01 - Any Road
EN09 - N/A
SD06 - High braking
IU01 - Correctly used

Normal driving on Any roads during Any conditions with high Braking, the driver correctly using the lane keeping assistance function.
Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane
DV02 - Function unexpectedly activated
the lane keeping assistance function is NOT required in such situation
EV03 - Car spins out of control
lane keeping assistance tries to apply steering torque while Hard break, a vehicle accident would not be controllable.
The lane keeping assistance function is NOT required while Hard Breaking is performed
E3 - Medium probability
once a month or more, situation is frequant in chaotic cities and socities
S2 - Severe and life-threatening injuries
on Hard break, and sudden steering may flip the car, or cause a crash on low speed
C2 - Normally controllable

90 % or more of all drivers or other traffic participants are usually able to avoid harm, we don't see cars flipping more often
ASIL A
The lane keeping assistance function shall be terminated when driver put his foot on the breaks.

Hazard Identification

Deviation	Deviation Details	Hazardous Event (resulting effect)	Event Details
DV04 Actor effect is too much	The LDW function applies an oscillating torque with very high torque (above limit).	EV00 - Collision with other vehicle	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.
DV03 Function always activated	the lane keeping assistance function is always activate	EV00 - Collision with other vehicle	lane keeping assistance was always on and had no time limit, driver hands may NOT be on the wheel at high speeds, a vehicle accident would not be controllable.
DV11 - Actor effect is wrong	The LDW function applies false oscillating torque frequantly.	EV03 - Car spins out of control	lanes are not clear on icey road, which fires false LDWs
DV02 - Function unexpectedly activated	the lane keeping assistance function is NOT required in such situation	EV03 - Car spins out of control	lane keeping assistance tries to apply steering torque while Hard break, a vehicle accident would not be controllable.

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Hazardous Event Description	**Exposure (of situation)**	**Rationale (for exposure)**	**Severity (of potential harm)**
The LDW function applies too high an oscillating torque to the steering wheel (above limit).	E3 - Medium probability	Driving On slippary Highway (because of rain) is very frequant in winter (or everyday in tropical weather)	S3 - Life-threatening or fatal injuries
The lane keeping assistance function was NOT meant for fully autonomous driving.	E2 - Low probability	(on Highway with Highspeed + Misuse system) combination probably does not happen often	S3 - Life-threatening or fatal injuries
the LDW function applies wrong oscillating torque to steering wheel	E1 - Very low probability	once in a year or less.	S3 - Life-threatening or fatal injuries
The lane keeping assistance function is NOT required while Hard Breaking is performed	E3 - Medium probability	once a month or more, situation is frequant in chaotic cities and socities	S2 - Severe and life-threatening injuries

dous Event Classification

Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)
Highway Speed limits are relativly high, and crashing on high speed is life-theatening	C3 - Difficult to control or uncontrollable	less than 90% of all drivers were able to avoid harm in that setuation
Crash on high speed is fatal	C3 - Difficult to control or uncontrollable	less than 90% of all drivers were able to avoid harm in that setuation
on high speed, car crash is fataly harmful	C3 - Difficult to control or uncontrollable	less than 90% of drivers can control slippary car on icey road
on Hard break, and sudden steering may flip the car, or cause a crash on low speed	C2 - Normally controllable	90 % or more of all drivers or other traffic participants are usually able to avoid harm, we don't see cars flipping more often

Determination of ASIL and Safety Goals	
ASIL Determination	**Safety Goal**
ASIL C	The oscillating torque from the Lane Departure Warning (LDW) function shall be limited.
ASIL B	The lane keeping assistance function shall be time limited and the additional steering torque shall end after a given time interval so that the driver cannot misuse the system for autonomous driving.
ASIL A	The oscillating torque from the Lane Departure Warning (LDW) function shall stop when driver is trying to control the car in bad weather conditions.
ASIL A	The lane keeping assistance function shall be terminated when driver put his foot on the breaks.