**AI PROJECT**

**GROUP 10**

**Knowledge Base**

**FACTS(120)**

% Car brands  
brand(toyota).  
brand(honda).  
brand(ford).  
brand(bmw).  
brand(audi).  
brand(mercedes).  
brand(chevrolet).  
brand(nissan).  
brand(hyundai).  
brand(kia).  
  
% Car models  
model(toyota, camry).  
model(toyota, corolla).  
model(honda, accord).  
model(honda, civic).  
model(ford, mustang).  
model(ford, focus).  
model(bmw, series3).  
model(bmw, series5).  
model(audi, a4).  
model(audi, a6).  
model(mercedes, c\_class).  
model(mercedes, e\_class).  
model(chevrolet, impala).  
model(chevrolet, malibu).  
model(nissan, altima).  
model(nissan, maxima).  
model(hyundai, elantra).  
model(hyundai, sonata).  
model(kia, optima).  
model(kia, soul).  
  
% Car types  
type(camry, sedan).  
type(corolla, sedan).  
type(accord, sedan).  
type(civic, sedan).  
type(mustang, coupe).  
type(focus, hatchback).  
type(series3, sedan).  
type(series5, sedan).  
type(a4, sedan).  
type(a6, sedan).  
type(c\_class, sedan).  
type(e\_class, sedan).  
type(impala, sedan).  
type(malibu, sedan).  
type(altima, sedan).  
type(maxima, sedan).  
type(elantra, sedan).  
type(sonata, sedan).  
type(optima, sedan).  
type(soul, hatchback).  
  
% Fuel types  
fuel(camry, diesel).  
fuel(corolla, diesel).  
fuel(accord, petrol).  
fuel(civic, petrol).  
fuel(mustang, petrol).  
fuel(focus, petrol).  
fuel(series3, diesel).  
fuel(series5, diesel).  
fuel(a4, diesel).  
fuel(a6, diesel).  
fuel(c\_class, petrol).  
fuel(e\_class, petrol).  
fuel(impala, petrol).  
fuel(malibu, petrol).  
fuel(altima, petrol).  
fuel(maxima, petrol).  
fuel(elantra, petrol).  
fuel(sonata, petrol).  
fuel(optima, petrol).  
fuel(soul, petrol).  
  
% Car origins  
origin(toyota, japan).  
origin(honda, japan).  
origin(ford, usa).  
origin(bmw, germany).  
origin(audi, germany).  
origin(mercedes, germany).  
origin(chevrolet, usa).  
origin(nissan, japan).  
origin(hyundai, south\_korea).  
origin(kia, south\_korea).  
  
% Car prices (in thousands of dollars)  
price(camry, 25).  
price(corolla, 20).  
price(accord, 26).  
price(civic, 21).  
price(mustang, 35).  
price(focus, 19).  
price(series3, 40).  
price(series5, 55).  
price(a4, 38).  
price(a6, 50).  
price(c\_class, 41).  
price(e\_class, 54).  
price(impala, 31).  
price(malibu, 23).  
price(altima, 24).  
price(maxima, 34).  
price(elantra, 19).  
price(sonata, 22).  
price(optima, 23).  
price(soul, 18).  
  
% Car years  
year(camry, 2020).  
year(corolla, 2019).  
year(accord, 2021).  
year(civic, 2020).  
year(mustang, 2021).  
year(focus, 2018).  
year(series3, 2019).  
year(series5, 2021).  
year(a4, 2018).  
year(a6, 2020).  
year(c\_class, 2021).  
year(e\_class, 2019).  
year(impala, 2020).  
year(malibu, 2019).  
year(altima, 2021).  
year(maxima, 2020).  
year(elantra, 2019).  
year(sonata, 2020).  
year(optima, 2018).  
year(soul, 2017).

**RULES(80)**

% Rule to determine if a car is expensive  
expensive(Model) :-  
price(Model, Price),  
Price > 30.  
  
% Rule to determine if a car is a recent model (2020 or newer)  
recent(Model) :-  
year(Model, Year),  
Year >= 2020.  
  
% Rule to find cars from a specific brand  
cars\_of\_brand(Brand, Model) :-  
model(Brand, Model).  
  
% Rule to find cars of a specific type  
cars\_of\_type(Type, Model) :-  
type(Model, Type).  
  
% Rule to find cars by fuel type  
cars\_by\_fuel(FuelType, Model) :-  
fuel(Model, FuelType).  
  
% Rule to find cars by origin country  
cars\_by\_origin(Country, Brand) :-  
origin(Brand, Country).  
  
% Rule to find cars within a price range  
cars\_within\_price\_range(MinPrice, MaxPrice, Model) :-  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find if the input is the cheapest car  
cheapest\_car(Model) :-  
price(Model, Price),  
\+ (price(\_, OtherPrice), OtherPrice < Price).  
  
% Rule to find if the input is the most expensive car  
most\_expensive\_car(Model) :-  
price(Model, Price),  
\+ (price(\_, OtherPrice), OtherPrice > Price).  
  
% Rule to find the oldest car  
oldest\_car(Model) :-  
year(Model, Year),  
\+ (year(\_, OtherYear), OtherYear < Year).  
  
% Rule to find the newest car  
newest\_car(Model) :-  
year(Model, Year),  
\+ (year(\_, OtherYear), OtherYear > Year).  
  
% Rule to find cars with a specific brand and type  
brand\_and\_type(Brand, Type, Model) :-  
model(Brand, Model),  
type(Model, Type).  
  
% Rule to find Japanese cars produced after 2018 that cost over $20,000  
japanese\_post2018\_20kplus(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
year(Model, Year),  
Year > 2018,  
price(Model, Price),  
Price > 20.  
  
% Rule to find German coupes  
german\_coupe(Model) :-  
origin(Brand, germany),  
model(Brand, Model),  
type(Model, coupe).  
  
% Rule to find sedans that cost under $25,000 and use petrol  
affordable\_petrol\_sedan(Model) :-  
type(Model, sedan),  
fuel(Model, petrol),  
price(Model, Price),  
Price < 25.  
  
% Rule to find hatchbacks that are from 2019 and cost less than $20,000  
budget\_2019\_hatchback(Model) :-  
type(Model, hatchback),  
year(Model, 2019),  
price(Model, Price),  
Price < 20.  
  
% Rule to find cars with petrol fuel and produced in 2021  
petrol\_2021\_car(Model) :-  
fuel(Model, petrol),  
year(Model, 2021).  
  
% Rule to find sedans costing between $20,000 and $25,000  
sedan\_20\_25k(Model) :-  
type(Model, sedan),  
price(Model, Price),  
Price >= 20,  
Price =< 25.  
  
% Rule to find cars with a specific brand and fuel type  
brand\_and\_fuel(Brand, FuelType, Model) :-  
model(Brand, Model),  
fuel(Model, FuelType).  
  
% Rule to find cars with a specific brand and within a price range  
brand\_within\_price\_range(Brand, MinPrice, MaxPrice, Model) :-  
model(Brand, Model),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific brand and year  
brand\_and\_year(Brand, Year, Model) :-  
model(Brand, Model),  
year(Model, Year).  
  
% Rule to find cars with a specific type and within a price range  
type\_within\_price\_range(Type, MinPrice, MaxPrice, Model) :-  
type(Model, Type),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars made before 2018 with diesel fuel  
old\_diesel\_car(Model) :-  
year(Model, Year),  
Year < 2018,  
fuel(Model, diesel).  
  
% Rule to find hatchbacks from Japan  
japanese\_hatchback(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
type(Model, hatchback).  
  
% Rule to find cars that cost more than $40,000 and are from Germany  
luxury\_german\_car(Model) :-  
origin(Brand, germany),  
model(Brand, Model),  
price(Model, Price),  
Price > 40.  
  
% Rule to find the cheapest sedan from South Korea  
cheapest\_korean\_sedan(Model) :-  
origin(Brand, south\_korea),  
model(Brand, Model),  
type(Model, sedan),  
price(Model, Price),  
\+ (price(\_, OtherPrice), OtherPrice < Price, type(\_, sedan), origin(\_, south\_korea)).  
  
% Rule to find American hatchbacks  
american\_hatchback(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
type(Model, hatchback).  
  
% Rule to find sedans that run on diesel fuel and are made after 2019  
recent\_diesel\_sedan(Model) :-  
type(Model, sedan),  
fuel(Model, diesel),  
year(Model, Year),  
Year > 2019.  
  
% Rule to find cars with a specific type and fuel type  
type\_and\_fuel(Type, FuelType, Model) :-  
type(Model, Type),  
fuel(Model, FuelType).  
  
% Rule to find cars with a specific type and year  
type\_and\_year(Type, Year, Model) :-  
type(Model, Type),  
year(Model, Year).  
  
% Rule to find cars with a specific fuel type and within a price range  
fuel\_within\_price\_range(FuelType, MinPrice, MaxPrice, Model) :-  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific fuel type and year  
fuel\_and\_year(FuelType, Year, Model) :-  
fuel(Model, FuelType),  
year(Model, Year).  
  
% Rule to find cars with a specific origin and type  
origin\_and\_type(Country, Type, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
type(Model, Type).  
  
% Rule to find cars with a specific origin and fuel type  
origin\_and\_fuel(Country, FuelType, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
fuel(Model, FuelType).  
  
% Rule to find cars with a specific origin and within a price range  
origin\_within\_price\_range(Country, MinPrice, MaxPrice, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific origin and year  
origin\_and\_year(Country, Year, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
year(Model, Year).  
  
% Rule to find cars with a specific origin, type, and fuel type  
origin\_type\_fuel(Country, Type, FuelType, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
type(Model, Type),  
fuel(Model, FuelType).  
  
% Rule to find cars with a specific origin, type, and within a price range  
origin\_type\_price(Country, Type, MinPrice, MaxPrice, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
type(Model, Type),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific origin, fuel type, and year  
origin\_fuel\_year(Country, FuelType, Year, Model) :-  
origin(Brand, Country),  
model(Brand, Model),  
fuel(Model, FuelType),  
year(Model, Year).  
  
% Rule to find cars with a specific type, fuel type, and year  
type\_fuel\_year(Type, FuelType, Year, Model) :-  
type(Model, Type),  
fuel(Model, FuelType),  
year(Model, Year).  
  
% Rule to find cars with a specific type, fuel type, and within a price range  
type\_fuel\_price(Type, FuelType, MinPrice, MaxPrice, Model) :-  
type(Model, Type),  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific brand, type, and fuel type  
brand\_type\_fuel(Brand, Type, FuelType, Model) :-  
model(Brand, Model),  
type(Model, Type),  
fuel(Model, FuelType).  
  
% Rule to find cars with a specific brand, type, and within a price range  
brand\_type\_price(Brand, Type, MinPrice, MaxPrice, Model) :-  
model(Brand, Model),  
type(Model, Type),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific brand, type, and year  
brand\_type\_year(Brand, Type, Year, Model) :-  
model(Brand, Model),  
type(Model, Type),  
year(Model, Year).  
  
% Rule to find cars with a specific brand, fuel type, and within a price range  
brand\_fuel\_price(Brand, FuelType, MinPrice, MaxPrice, Model) :-  
model(Brand, Model),  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific brand, fuel type, and year  
brand\_fuel\_year(Brand, FuelType, Year, Model) :-  
model(Brand, Model),  
fuel(Model, FuelType),  
year(Model, Year).  
  
% Rule to find cars with a specific brand, type, fuel type, and within a price range  
brand\_type\_fuel\_price(Brand, Type, FuelType, MinPrice, MaxPrice, Model) :-  
model(Brand, Model),  
type(Model, Type),  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice.  
  
% Rule to find cars with a specific brand, type, fuel type, and year  
brand\_type\_fuel\_year(Brand, Type, FuelType, Year, Model) :-  
model(Brand, Model),  
type(Model, Type),  
fuel(Model, FuelType),  
year(Model, Year).  
  
% Rule to find cars with a specific brand, type, within a price range, and year  
brand\_type\_price\_year(Brand, Type, MinPrice, MaxPrice, Year, Model) :-  
model(Brand, Model),  
type(Model, Type),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice,  
year(Model, Year).  
  
% Rule to find cars with a specific brand, fuel type, within a price range, and year  
brand\_fuel\_price\_year(Brand, FuelType, MinPrice, MaxPrice, Year, Model) :-  
model(Brand, Model),  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice,  
year(Model, Year).  
  
% Rule to find cars with a specific type, fuel type, within a price range, and year  
type\_fuel\_price\_year(Type, FuelType, MinPrice, MaxPrice, Year, Model) :-  
type(Model, Type),  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice,  
year(Model, Year).  
  
% Rule to find cars with a specific brand, type, fuel type, within a price range, and year  
brand\_type\_fuel\_price\_year(Brand, Type, FuelType, MinPrice, MaxPrice, Year, Model) :-  
model(Brand, Model),  
type(Model, Type),  
fuel(Model, FuelType),  
price(Model, Price),  
Price >= MinPrice,  
Price =< MaxPrice,  
year(Model, Year).  
  
% Rule to find cars that are from the USA and are sedans  
usa\_sedan(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
type(Model, sedan).  
  
% Rule to find cars from Japan that are less than $25,000  
japan\_under\_25k(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
price(Model, Price),  
Price < 25.  
  
% Rule to find hatchback cars produced before 2020  
older\_hatchback(Model) :-  
type(Model, hatchback),  
year(Model, Year),  
Year < 2020.  
  
% Rule to find German cars that use diesel  
german\_diesel(Model) :-  
origin(Brand, germany),  
model(Brand, Model),  
fuel(Model, diesel).  
  
% Rule to find South Korean sedans with a price over $20,000  
south\_korean\_expensive\_sedan(Model) :-  
origin(Brand, south\_korea),  
model(Brand, Model),  
type(Model, sedan),  
price(Model, Price),  
Price > 20.  
  
% Rule to find cars that are German sedans from 2021  
german\_sedan\_2021(Model) :-  
origin(Brand, germany),  
model(Brand, Model),  
type(Model, sedan),  
year(Model, 2021).  
  
% Rule to find Japanese coupes  
japanese\_coupe(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
type(Model, coupe).  
  
% Rule to find cars under $20,000 made in 2018 or earlier  
affordable\_old\_car(Model) :-  
price(Model, Price),  
Price < 20,  
year(Model, Year),  
Year =< 2018.  
  
% Rule to find American cars with petrol fuel  
american\_petrol\_car(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
fuel(Model, petrol).  
  
% Rule to find cars that are sedans with a price between $20,000 and $30,000  
sedan\_in\_20\_30k(Model) :-  
type(Model, sedan),  
price(Model, Price),  
Price >= 20,  
Price =< 30.  
  
% Rule to find cars made in 2020 that cost more than $30,000  
expensive\_2020\_car(Model) :-  
year(Model, 2020),  
price(Model, Price),  
Price > 30.  
  
% Rule to find Japanese sedans that run on diesel  
japanese\_diesel\_sedan(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
type(Model, sedan),  
fuel(Model, diesel).  
  
% Rule to find cars that are German sedans produced in 2019  
german\_sedan\_2019(Model) :-  
origin(Brand, germany),  
model(Brand, Model),  
type(Model, sedan),  
year(Model, 2019).  
  
% Rule to find South Korean cars made before 2019  
old\_south\_korean(Model) :-  
origin(Brand, south\_korea),  
model(Brand, Model),  
year(Model, Year),  
Year < 2019.  
  
% Rule to find American sedans costing above $25,000  
american\_expensive\_sedan(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
type(Model, sedan),  
price(Model, Price),  
Price > 25.  
  
% Rule to find the oldest diesel sedan  
oldest\_diesel\_sedan(Model) :-  
type(Model, sedan),  
fuel(Model, diesel),  
year(Model, Year),  
\+ (year(\_, OtherYear), OtherYear < Year, fuel(\_, diesel), type(\_, sedan)).  
  
% Rule to find the most recent American car under $25,000  
newest\_american\_under\_25k(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
price(Model, Price),  
Price < 25,  
year(Model, Year),  
\+ (year(\_, OtherYear), OtherYear > Year, origin(\_, usa), price(\_, OtherPrice), OtherPrice < 25).  
  
% Rule to find American cars that cost between $20,000 and $30,000 and run on petrol  
american\_midprice\_petrol(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
fuel(Model, petrol),  
price(Model, Price),  
Price >= 20,  
Price =< 30.  
  
% Rule to find Japanese sedans from 2020 or newer that run on petrol  
japanese\_recent\_petrol\_sedan(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
type(Model, sedan),  
fuel(Model, petrol),  
year(Model, Year),  
Year >= 2020.  
  
% Rule to find German cars under $30,000  
affordable\_german\_car(Model) :-  
origin(Brand, germany),  
model(Brand, Model),  
price(Model, Price),  
Price < 30.  
  
% Rule to find sedans from South Korea produced in 2019  
korean\_sedan\_2019(Model) :-  
origin(Brand, south\_korea),  
model(Brand, Model),  
type(Model, sedan),  
year(Model, 2019).  
  
% Rule to find American cars with diesel fuel  
american\_diesel\_car(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
fuel(Model, diesel).  
  
% Rule to find cars from South Korea that use petrol and are sedans  
korean\_petrol\_sedan(Model) :-  
origin(Brand, south\_korea),  
model(Brand, Model),  
fuel(Model, petrol),  
type(Model, sedan).  
  
% Rule to find Japanese sedans made in 2021  
japanese\_2021\_sedan(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
type(Model, sedan),  
year(Model, 2021).  
  
% Rule to find South Korean hatchbacks  
korean\_hatchback(Model) :-  
origin(Brand, south\_korea),  
model(Brand, Model),  
type(Model, hatchback).  
  
% Rule to find American cars produced in or after 2019  
recent\_american\_car(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
year(Model, Year),  
Year >= 2019.  
  
% Rule to find the most recent Japanese car costing less than $30,000  
newest\_japanese\_under\_30k(Model) :-  
origin(Brand, japan),  
model(Brand, Model),  
price(Model, Price),  
Price < 30,  
year(Model, Year),  
\+ (year(\_, OtherYear), OtherYear > Year, origin(\_, japan), price(\_, OtherPrice), OtherPrice < 30).  
  
% Rule to find the cheapest American car with a price above $20,000  
cheapest\_american\_above\_20k(Model) :-  
origin(Brand, usa),  
model(Brand, Model),  
price(Model, Price),  
Price > 20,  
\+ (price(OtherModel, OtherPrice), OtherPrice < Price, origin(OtherBrand, usa), OtherPrice > 20).